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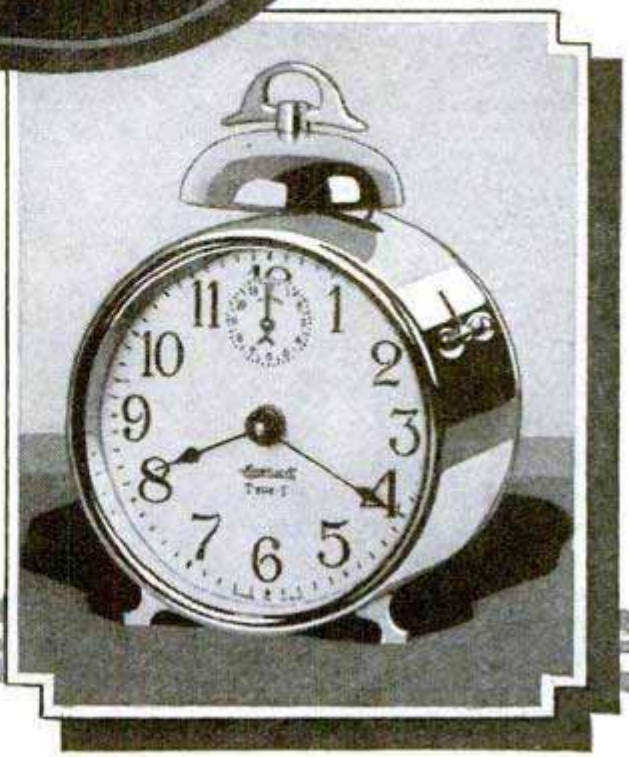

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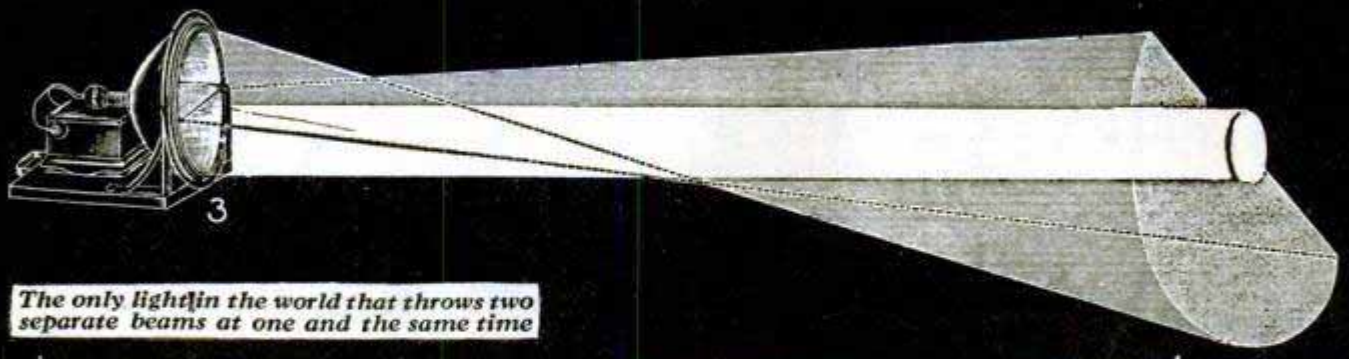

The only light in the world that throws two separate beams at one and the same time

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FITS inside regular reflector—easy to install—Wonderful Patented Device—100% more light—no glare. Pocket big money waiting for you now—whirlwind seller makes astounding demonstration, low cost, agents cleaning up.

300% Profit

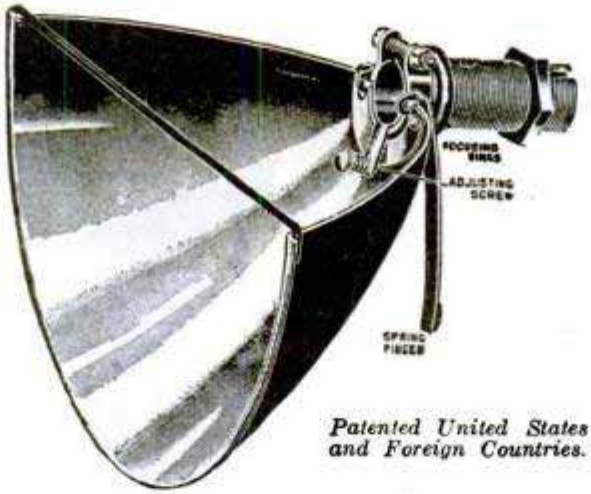
Big repeater, sells on sight. Enthusiastic customers multiply your sales. Over 300 sets sold in one town of 2,000 people.

Prominent Users

The Governor of Minnesota, the Governor of Colorado, the Mayor of Milwaukee, Chief of Police, Wichita, Kans., the General Manager of Milwaukee Motor Club and the Vice-President of Carolina Motor Club are all among the prominent users of Trippe Offset Reflectors.

Orders Pouring In From All Over the World

Our first advertising appeared in 1927 and we are already shipping TRIPPE OFFSET REFLECTORS to England, South Africa, Australia, New Zealand, Egypt, Cuba, Mexico, Peru and Canada. Many other foreign countries are asking for information regarding this—the greatest automobile headlight of all time.



Patented United States and Foreign Countries.

Salesmen Enthusiastic

"Frank B. Finch of Kansas sold 1398 sets the last six months of 1927 and expects to sell over 10,000 sets this year."

"Paul C. McLean of Providence, Rhode Island, telephones has just sold Public Service Corp. of Rhode Island 150 sets for entire fleet of cars. Rush 200 sets immediately."

"Have just sold Claude P. Madden 100 sets TRIPPE OFFSET REFLECTORS. Mr. Madden is the best known man in this county, having been mayor of this city two times and is a live wire."—C. S. Helm, Illinois.

"Cramer & Kirkwood, my local agents for this city, took over my entire first shipment of 100 sets TRIPPE OFFSET REFLECTORS. Please rush another 100 sets."—C. R. Bevill, Arkansas.

"Any man who could not sell TRIPPE OFFSET REFLECTORS, could not give food to a starving crowd."—J. G. Obiander.

"Friday night I had headlights inspected by State Inspectors. They said it was the greatest light they had ever put on the screen."—A. P. Wilbur, New York.

J. E. Dudd, of Washington, wires order for 200 sets and says, "Here goes for big business, and I feel that I am doing the public a favor in giving them the right kind of light."

Ideal Advertising Co., of Wisconsin, writes, "Am enclosing check for 100 sets TRIPPE OFFSET REFLECTORS. We plan on putting out at least ten salesmen."

Powell, of Canada, wires in an order for 200 sets and says, "We have set a quota of 2,000 sets during the next two months and WE CAN DO IT."

Jackson Bros. & Jones, of Cobridge, England, says, "We are pleased to inform you that TRIPPE OFFSET REFLECTORS are just what you claim them to be in every detail."

Wonderful Demonstration

"I set up the demonstrator on my back roof tonight and the whole neighborhood opened the windows and wanted to know what the h—— was going on. I agreed with them that the light is simply terrific, yet the glare is removed when attached the correct way to the cars."—W. H. Lamb, Maine.

24,000,000 Prospects Want This Light

Thousands killed in 1927 by weak lights—or glare. Country-wide movement for long, low, level, powerful beam that protects driver without blinding other fellow. Only Trippe Offset Auto Reflectors do this perfectly. Trippe light floods roads and side ditches. No glare to bewilder other drivers. Makes spotlights unnecessary.

Eliminates Glare Without Dimming or Tilting

Motorists are sick and tired of clumsy headlights, fragile dimmers, flimsy tilters and makeshift reflectors. These obsolete devices fail because they're not accurately designed. The Trippe Offset is scientifically correct—let us prove it.

38,000 Candle Power

Certified to in Report No. 42306 of The Electrical Testing Laboratory of New York City, the official testing laboratory of the Society of Automobile Engineers. The report says that TRIPPE OFFSET REFLECTORS meet every requirement of the Society of Automobile Engineers.

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Exclusive Territory

If you write NOW—tomorrow may be too late. It does not cost one cent to see this remarkable device. At our own risk, we will send you FREE SAMPLE. Test it in every way. It does all we say. Anyone can sell Trippe Offset Reflectors and make big money.

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Don't hesitate to investigate this big money-making plan immediately. Only the coupon, a postal or letter is needed. You are losing money every day you wait! At least get this proposition in front of you and study it carefully before deciding. One of the greatest money-making schemes ever put before specialty salesmen.

No matter what your experience in selling has been—no matter what you are now selling or what you are making you cannot afford not to get the facts.

Write NOW—TODAY—WHILE YOU ARE THINKING OF IT.

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☐ Salesmen. ☐ Distributors.

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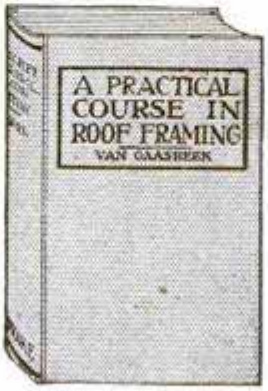

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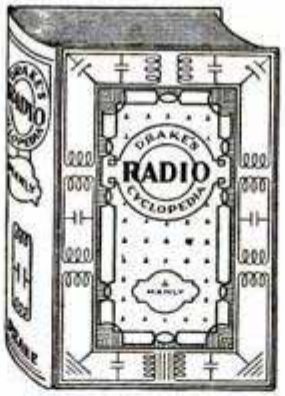

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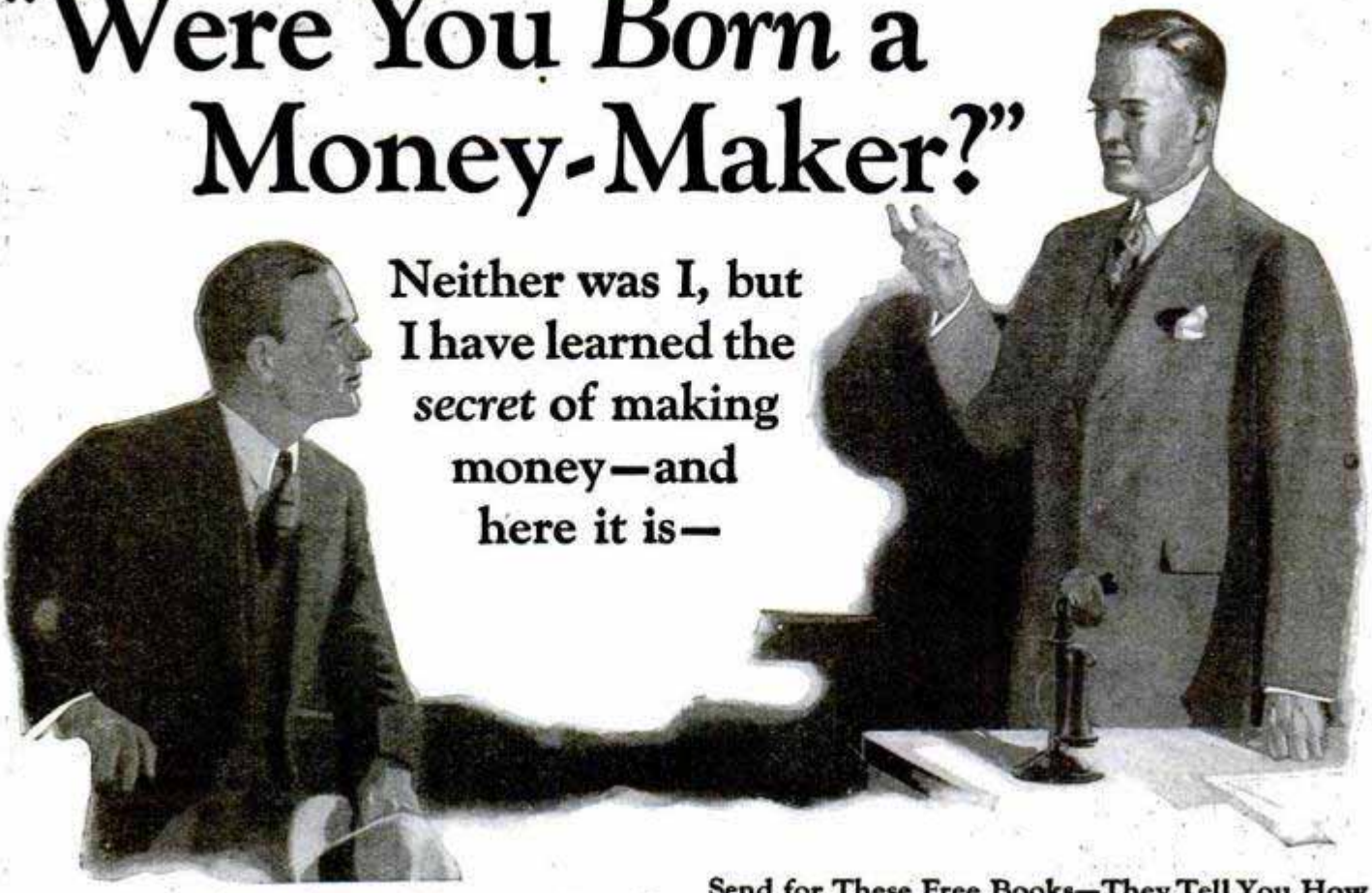

Neither was I, but I have learned the *secret* of making money—and here it is—

I'M going to let you in on a little secret, Tom. It ought to be worth at least $5,000 a year to you, and I'm not going to charge you a single penny—

"When I was your age, I was always wondering why the boss never seemed to take much interest in me. Every six months or so I would hit him for a 'raise'—and once in a great while I would get an extra $5 a week. But the big jobs—the jobs that paid real money—always went to someone else.

"Then something happened that set me thinking—

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"Well, I took myself aside, and for the first time in my life I looked the situation squarely in the face. That night I clipped and mailed a LaSalle coupon.

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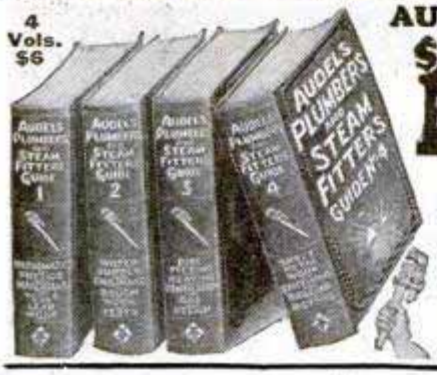

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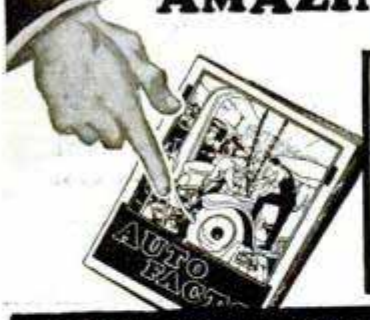

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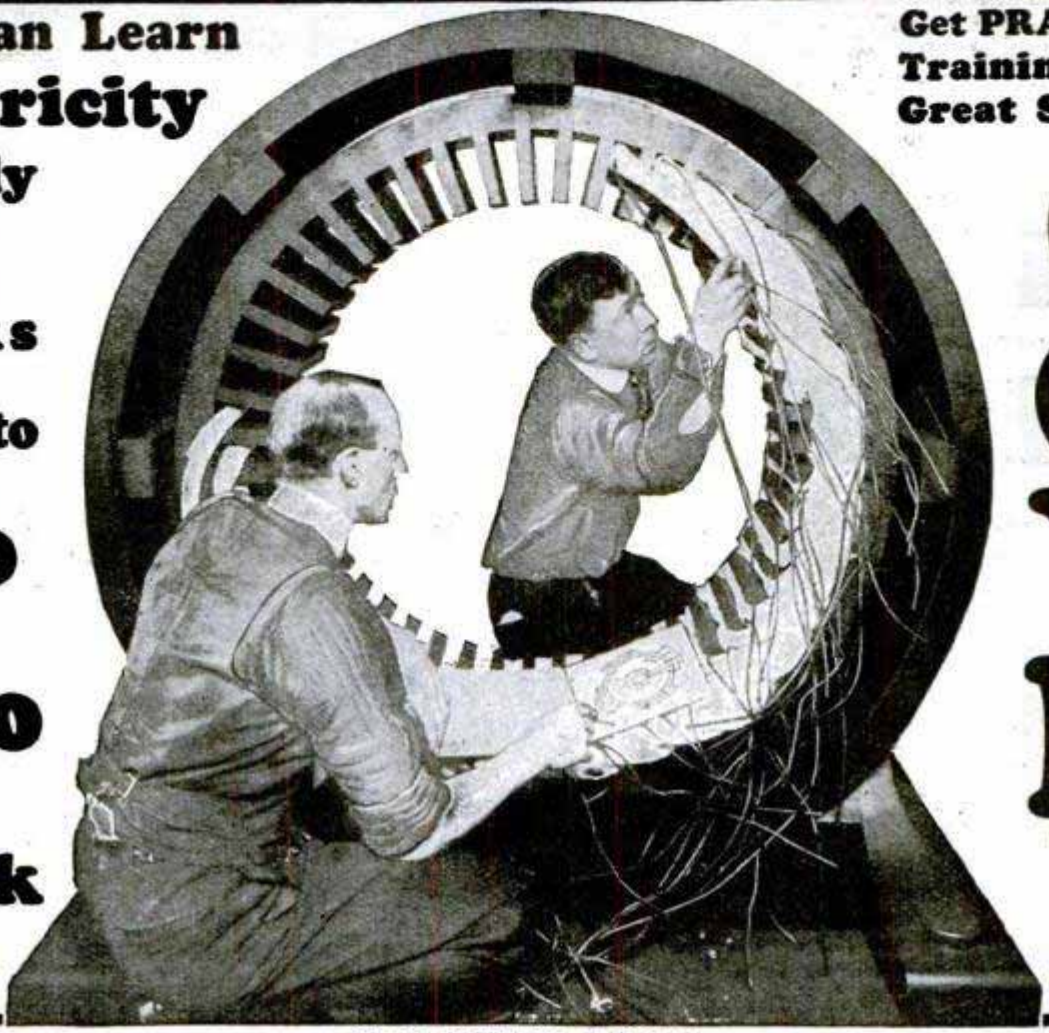

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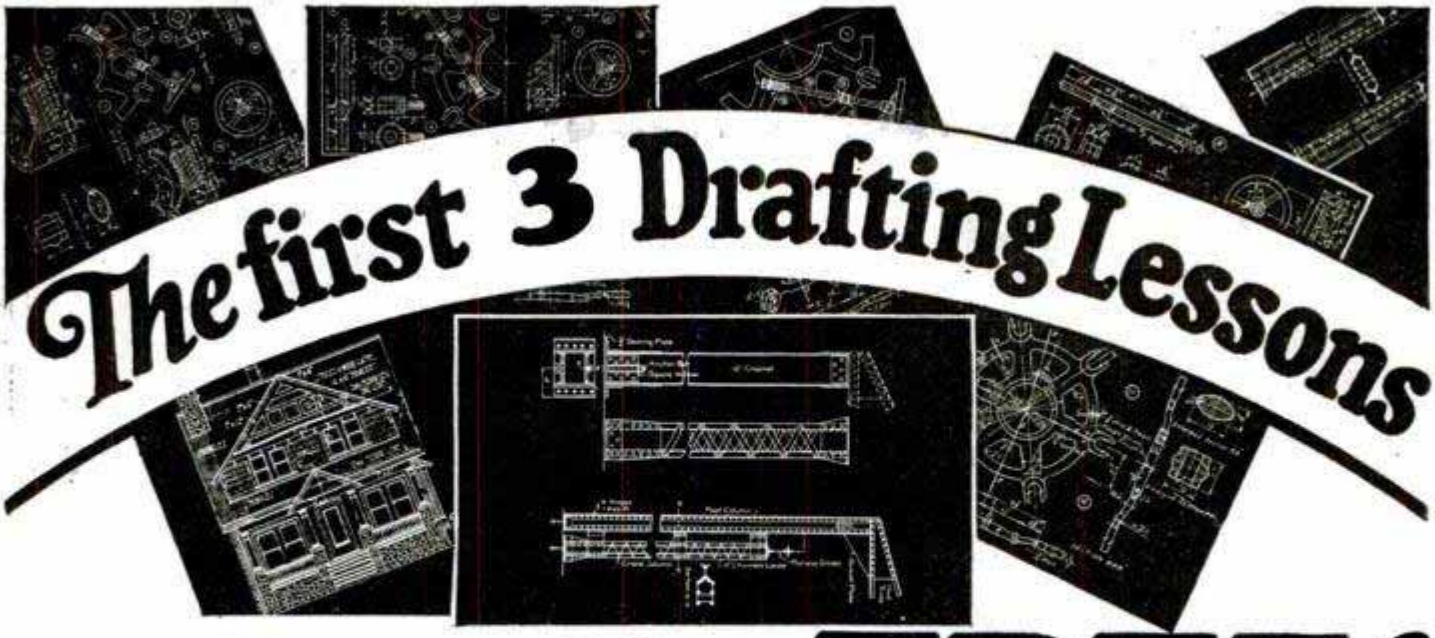

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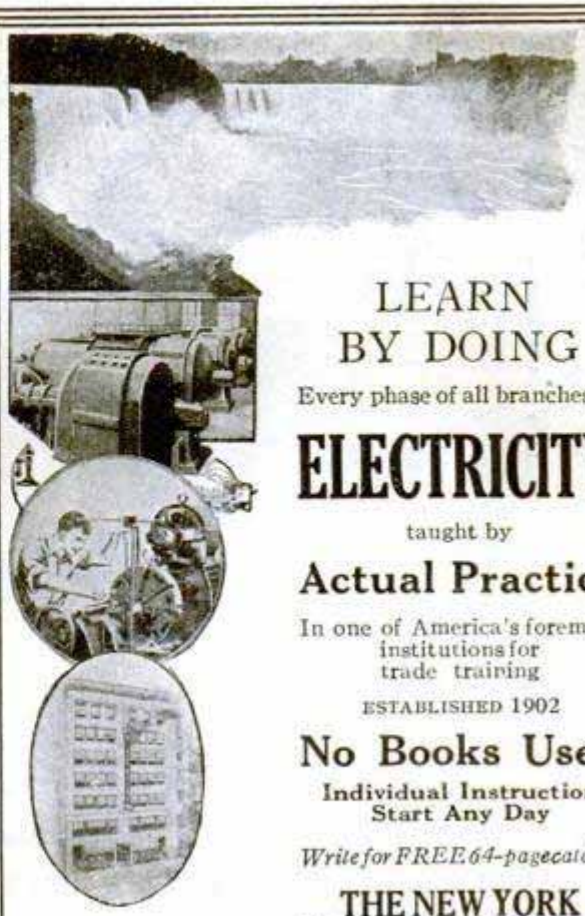

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Popular Mechanics Magazine, published monthly at Chicago, Ill., for April, 1928.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who, having been duly sworn according to law, deposes and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill. Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Managing Editor, L. K. Weber, 200 East Ontario St., Chicago, Ill. Business Manager, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Second. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) L. B. Windsor, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. WINDSOR, Jr., Editor and Business Manager. Sworn to and subscribed before me this 28th day of March, 1928. J. GRAHAM, Notary Public. (My commission expires June 17, 1928.)

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and I offered something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. Tomorrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will starve to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance.

A RE-BUILT MAN

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, sickly chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy, the kind that fire you with ambition and the courage to tackle anything set before you.

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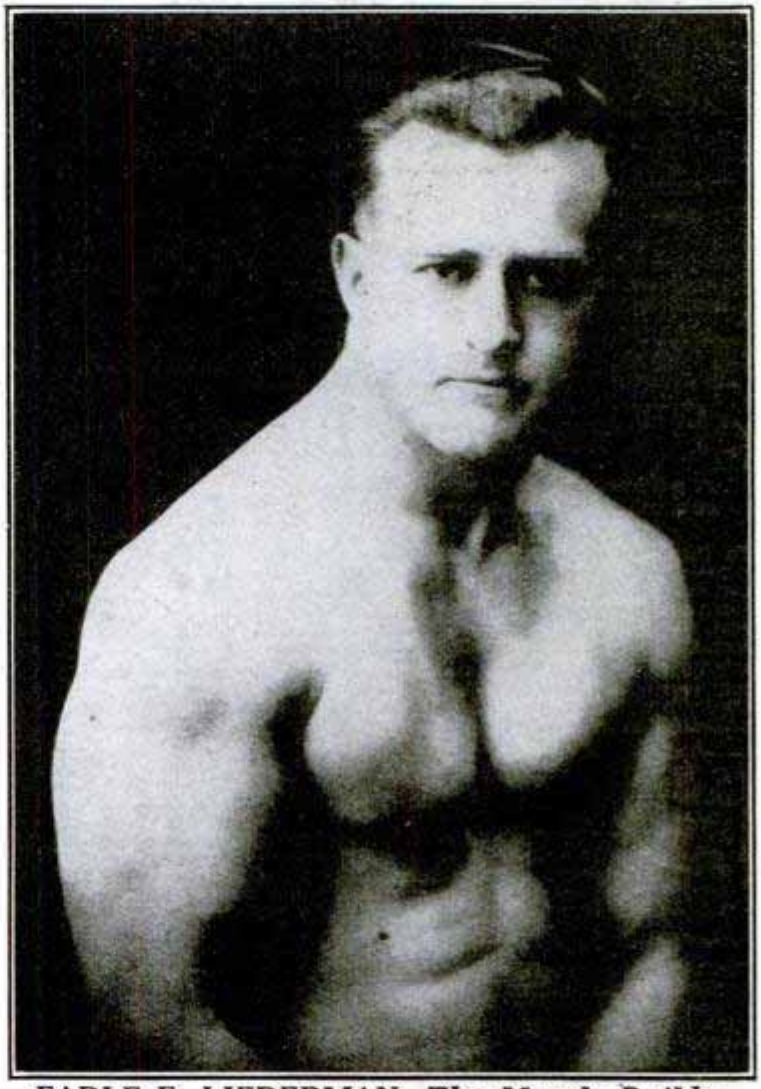
Who says it takes years to get in shape? Show me the man who makes any such claims and I'll make him eat his words. I'll put one full inch on your arm in just 30 days. Yes, and two full inches on your chest in the same length of time. Meanwhile I'm putting life and pep into your old back-bone. And from then on, just watch 'em grow. At the end of thirty days you won't know yourself. Your whole body will take on an entirely different appearance. But you've only started. Now comes the real works. I've only built my foundation. I want just 60 days more (90 in all) and you'll make those friends of yours who think they're strong look like something the cat dragged in.

A REAL MAN

When I'm through with you you're a real man. The kind that can prove it. You will be able to do things you had thought impossible. And the beauty of it is you keep on going. Your deep, full chest breathes in rich, pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge square shoulders and your massive muscular arms have that craving for the exercise of a regular he-man. You have the flash to your eye and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle, fellows. If you doubt me, make me prove it. Go ahead, I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them, I will do for you. Come then, for time flies and every day counts. Let this very day be the beginning of new life for you.



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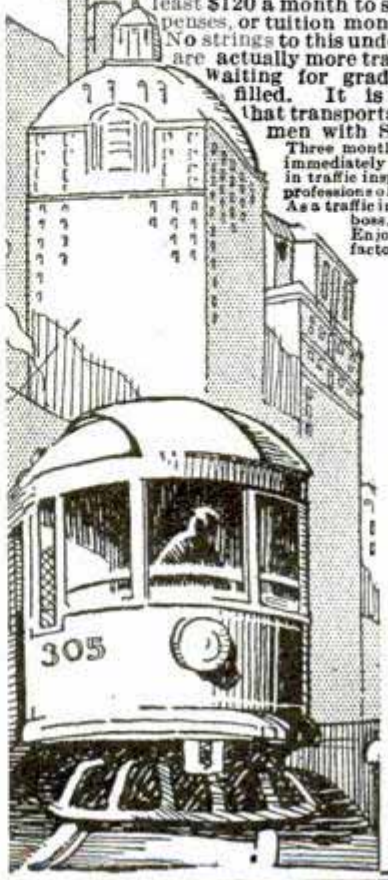

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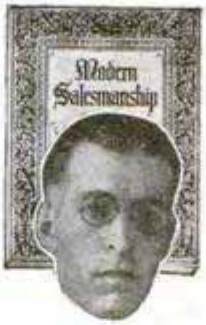

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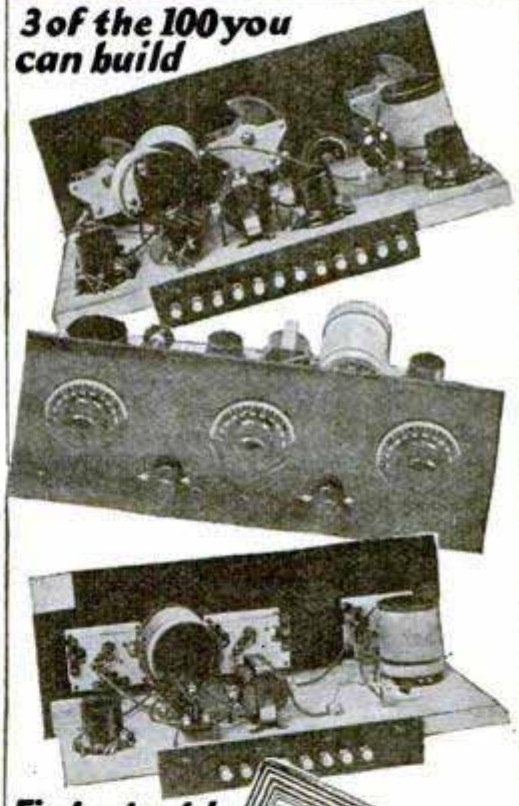

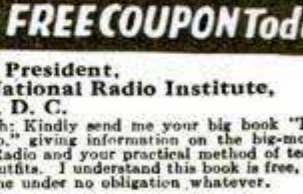

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I came near being a "chair-warmer" for life

—*when suddenly I learned how easy it is to be popular . . .*

"Who's dead, Don? Why don't you join in the fun—this is no funeral—it's a party."

I tried hard to smile. "I'm enjoying myself a lot, Ray," I lied.

"Well, why don't you dance then—just look at all the charming partners here tonight . . . Man alive! if you don't brace up you'll be a chair-warmer for life."

Ray hit the nail on the head. My only fun at a dance was a smoke with the boys. When the music started I was invariably on the sidelines. Now and then I'd try to "get by" with the latest steps. But I was so clumsy. I hopped. I knew that I continually fell out of step. No girl ever accepted me for a partner twice. And I never blamed her.

But Ray's remark struck a sore spot. So I blurted out my whole tale of woe to him. "If I could only dance like you, Ray, I'd be a happy fellow. But what's the use? It would take months for me to learn the latest steps correctly . . . and think of the expensive fees that private teachers charge."

"Who said these things were necessary?"

"Well, aren't they?" Now I was becoming curious.

"Of course not. I learned to dance right in my own room without music or partner. And it only cost me a few cents a day."

"You're kidding me," I scoffed.

"I'm *not* fooling. And to prove it I'm going to write to Arthur Murray, who made it so easy for me to become a good dancer, and ask him to send you 5 lessons from his famous set of home instructions. I'll wager at the next party you won't want to sit out a single dance."

If You Can Do This Step

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Arthur Murray, Studio 822,
7 East 43rd Street, New York City.

To prove that I can learn to dance at home in ten days you may send the FIVE FREE LESSONS. I enclose 10c (stamps or coin) to pay for the postage, printing, etc. You are to include free "The Short Cut to Popularity."

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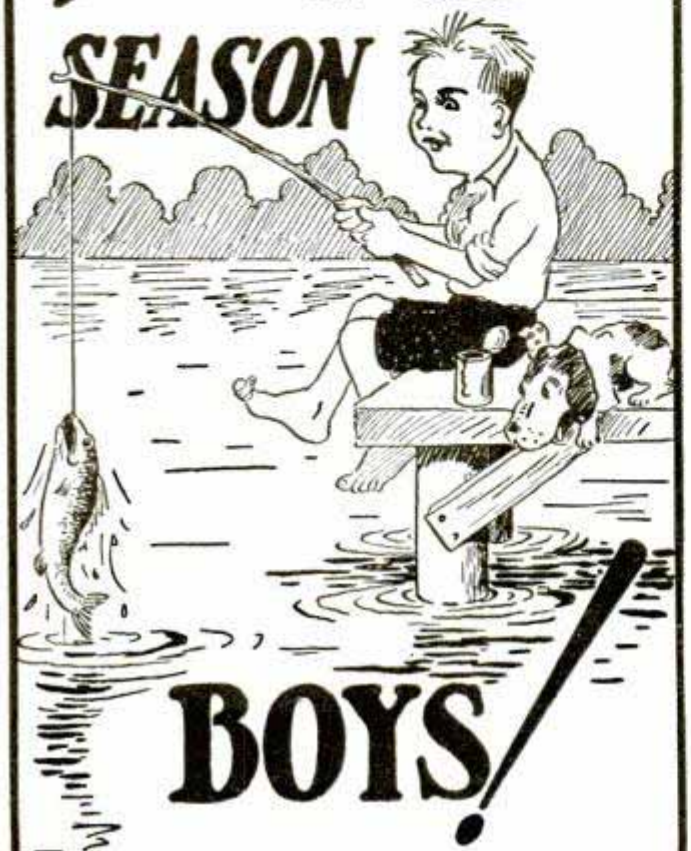
THE CATCH of the SEASON



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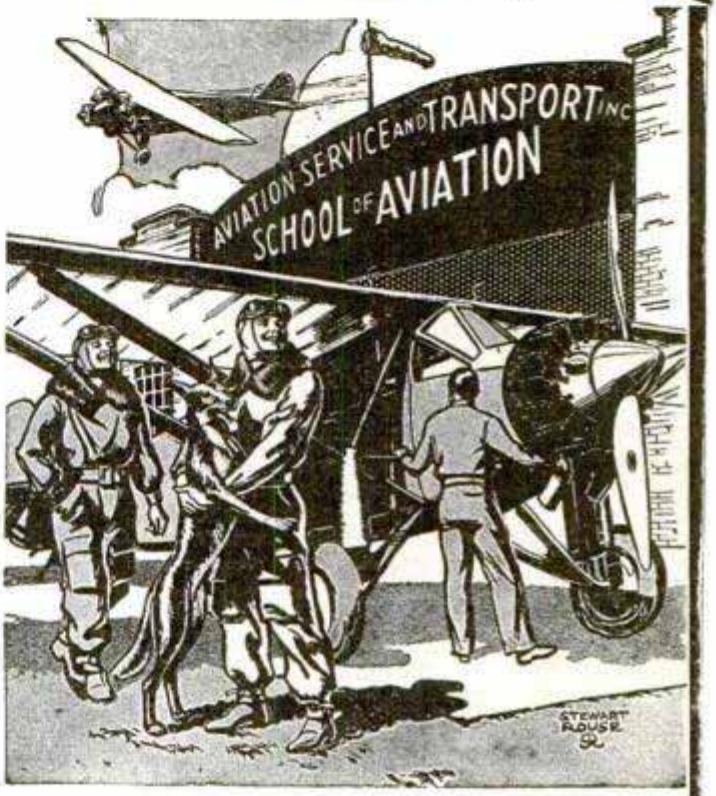

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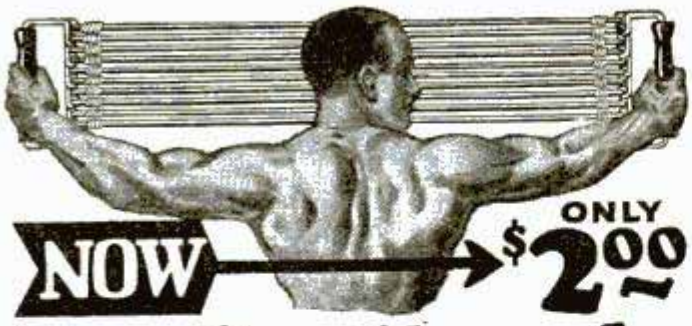

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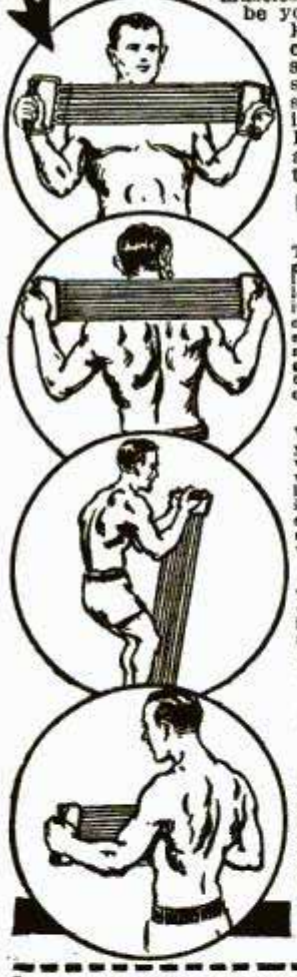

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They gave me the "ha-ha" when I offered to play

... but I was the life of the party after that

THE first day of Dorothy's house party at the shore had been a huge success. After swimming, boating and golfing all were ready for the wonderful dinner that followed.

"Well, folks," said Bill as we left the table, "I'm all set for a good dance."

"Fine," cried Dorothy, "Dick can make the banjo hum. Who'll play the piano?"

All looked at one another foolishly.

"Jim, you play, don't you?" asked Dot.

"Yes, I'll play 'Far, Far Away'," laughed Jim.

"Well then, Mabel, will you help us out?"

"Honestly, Dot, I hate to admit it, but I can't play a note," she answered.

It certainly looked as if the party were going flat.

Then I Offered to Play

"If you folks can stand it," I offered shyly, "I'll play for you."

The crowd instantly burst out into laughter.

"You may be able to play football, Jack, but you can't tackle a piano."

"I've never heard you play a note and I've known you all your life," cut in another.

As I strode to the piano I chuckled to myself: I had a surprise in store for them.

No one knew what to expect. They thought I was about to make a fool of myself.

Then—I struck the first snappy chords of that foot-loosing fox-trot, "St. Louis Blues." Dick, dumfounded, almost dropped his banjo. But in a flash he had picked up the rhythm and was strumming away like mad.

The crowd was all dancing in a jiffy. Fox-trots and waltzes—with rests few and far between.

After a good round of dancing I decided to give them some real music and began a beautiful Indian love lyric.

The couples were now seated quietly about the room, entranced by that plaintive melody.

No sooner had the last soft notes died away than I was surrounded by my astonished friends.

"How wonderful, Jack! Why haven't you played for us before?"

"How long have you been studying?"

"Why have you kept it a secret all these years when you might have been playing for us?"

"Who gave you lessons? He must be wonderful!"

I Reveal My Secret

Then I explained how I had made up my mind to go in for something besides sports. I wanted to play—to entertain others—to be popular. But when I thought of the great expense and long study and practice required, I hesitated.

Then one day I ran across an announcement in a magazine telling of a new, quick and simple way to learn music at home, without a teacher.

I was a little skeptical at first, but I sent for the free booklet and demonstration lesson. The moment I saw it I was convinced and sent for the complete course.

When the lessons arrived I started right in, giving a few minutes of my spare time each day. And what fun it was. No monotonous scales—no tedious exercises—no tricky methods—just a simple, common-sense system that even a child could understand. And I was playing my favorite numbers almost from the start.

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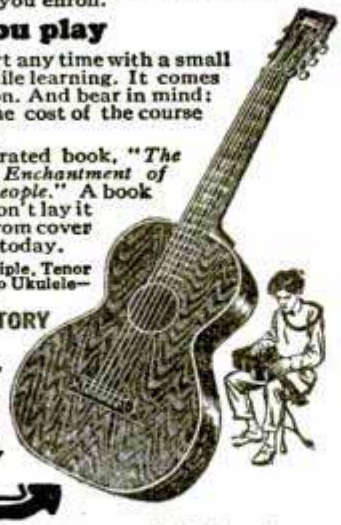

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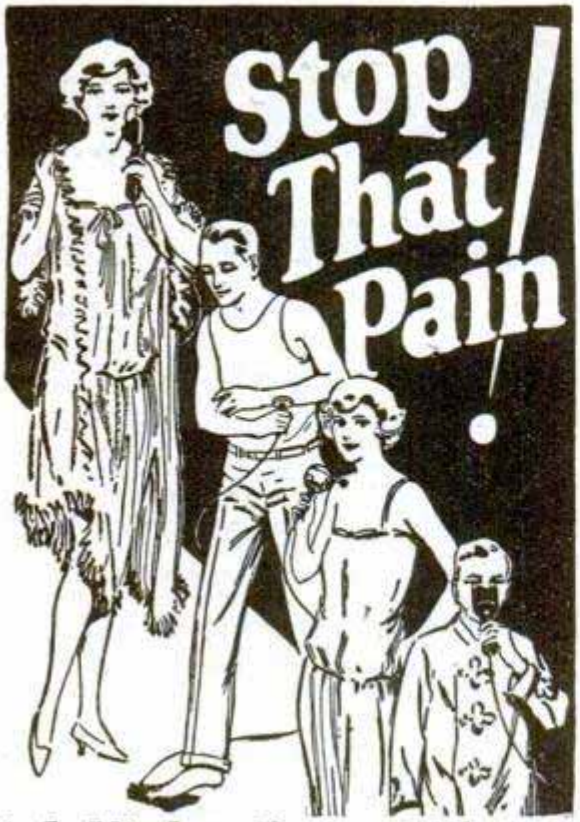

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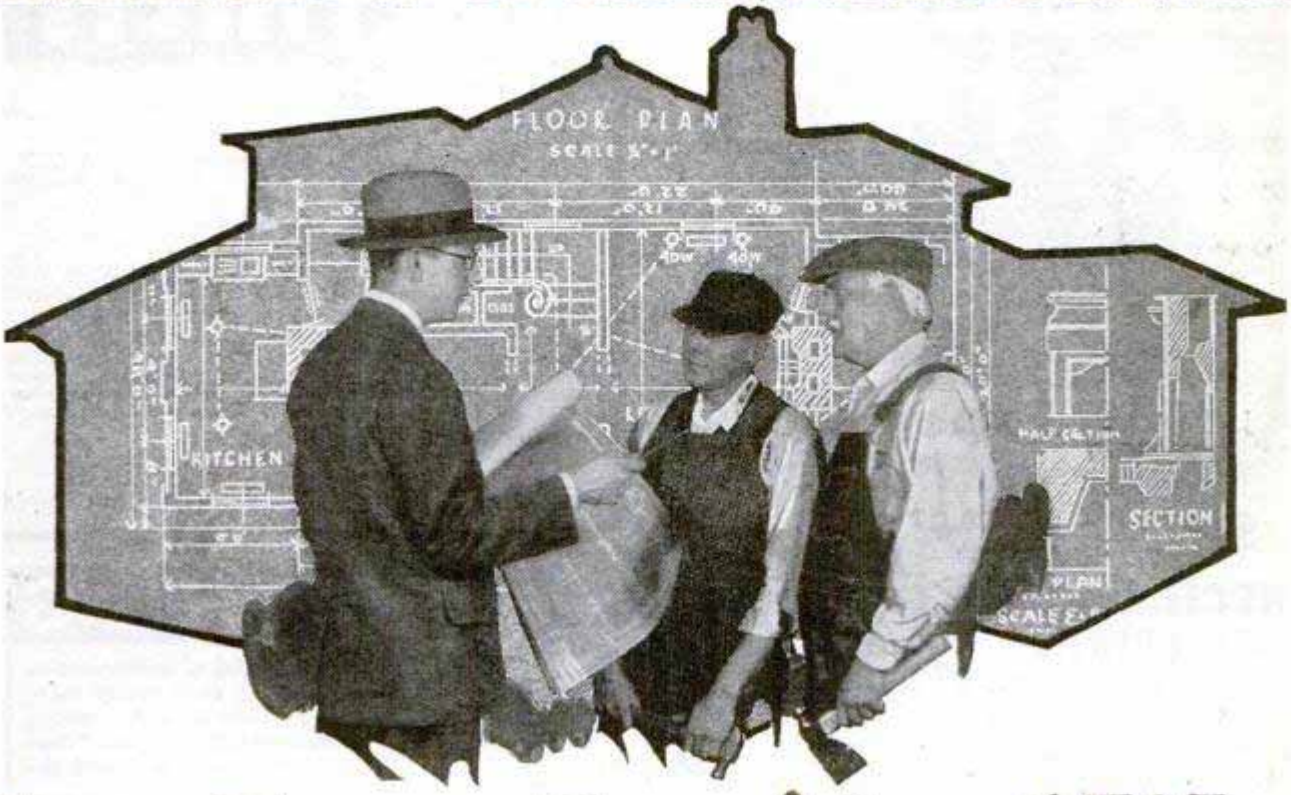

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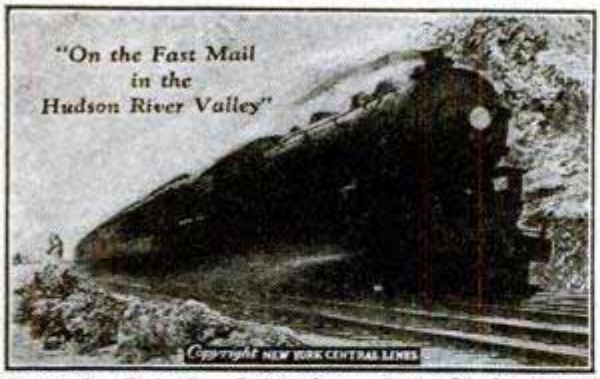

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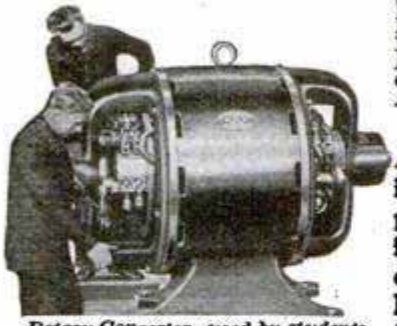

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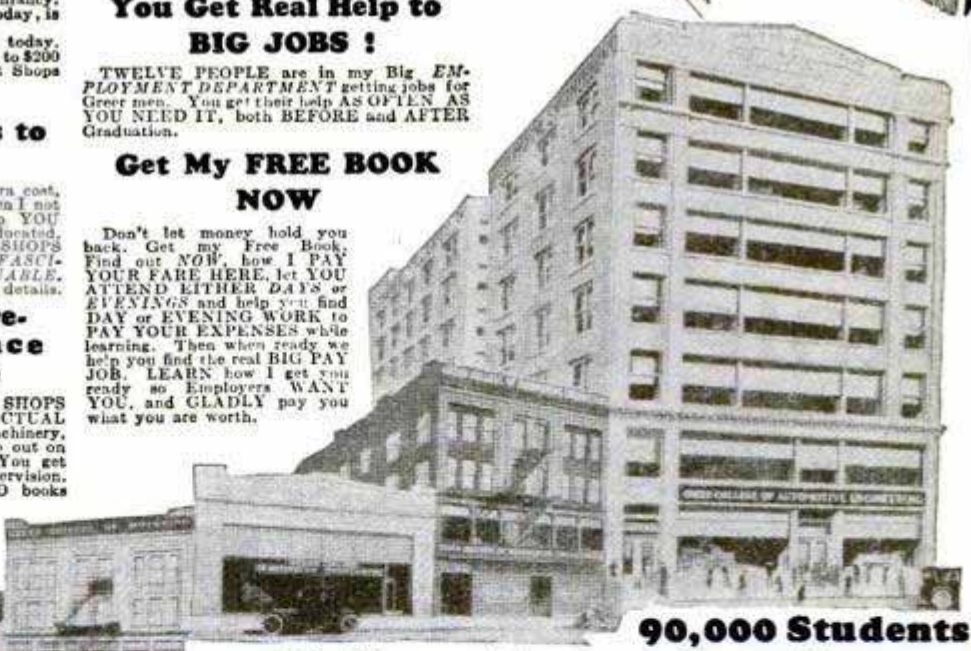

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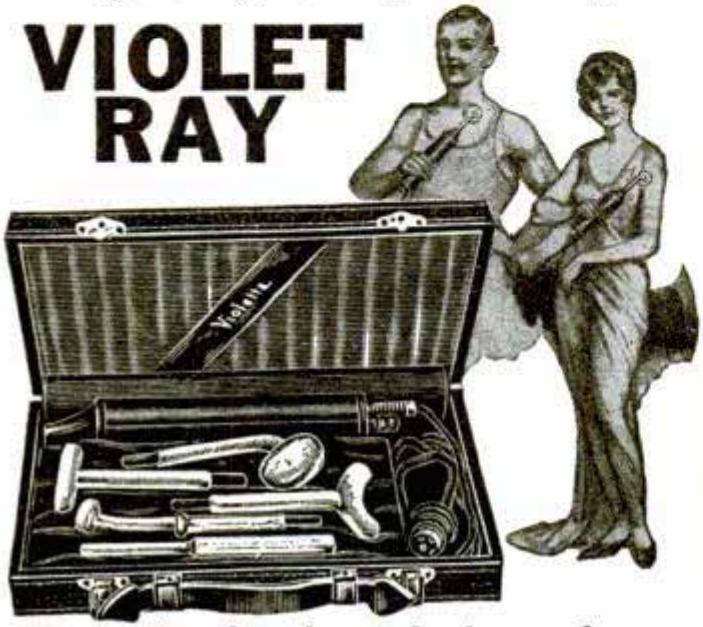

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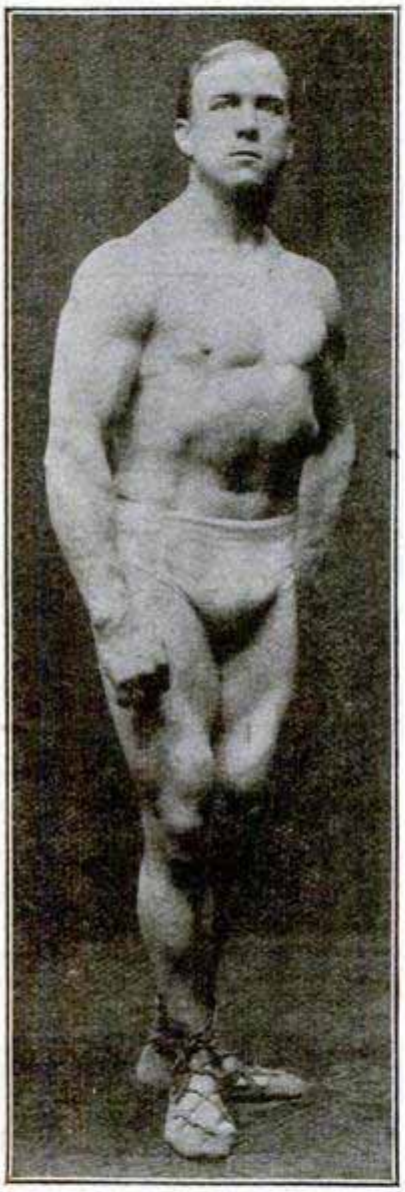

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You won't be regarded as a real man if you are a slouching, nervous, fidgeting grouch—slinking along, afraid of your shadow, timid in company; sallow-complexioned, pimply-faced—with shifting, cowardly eyes; round-shouldered, with unsteady step; a cold, clammy grip—lacking pep, punch or personality—you simply won't get anywhere.

Fellows of this type are not wanted. If you are a weakling, sickly, nervous and always pessimistic—you will feel your inferiority wherever you go. Men will shun you. Women will not be attracted to you. Even dogs will bark at you!

It is the penalty you pay for weakness!—but you won't have to pay this price if you will face the facts and make up your mind you are going to go to the mat with ill-health and fight to a finish. It's up to you—**to you alone.** You can overcome weakness.

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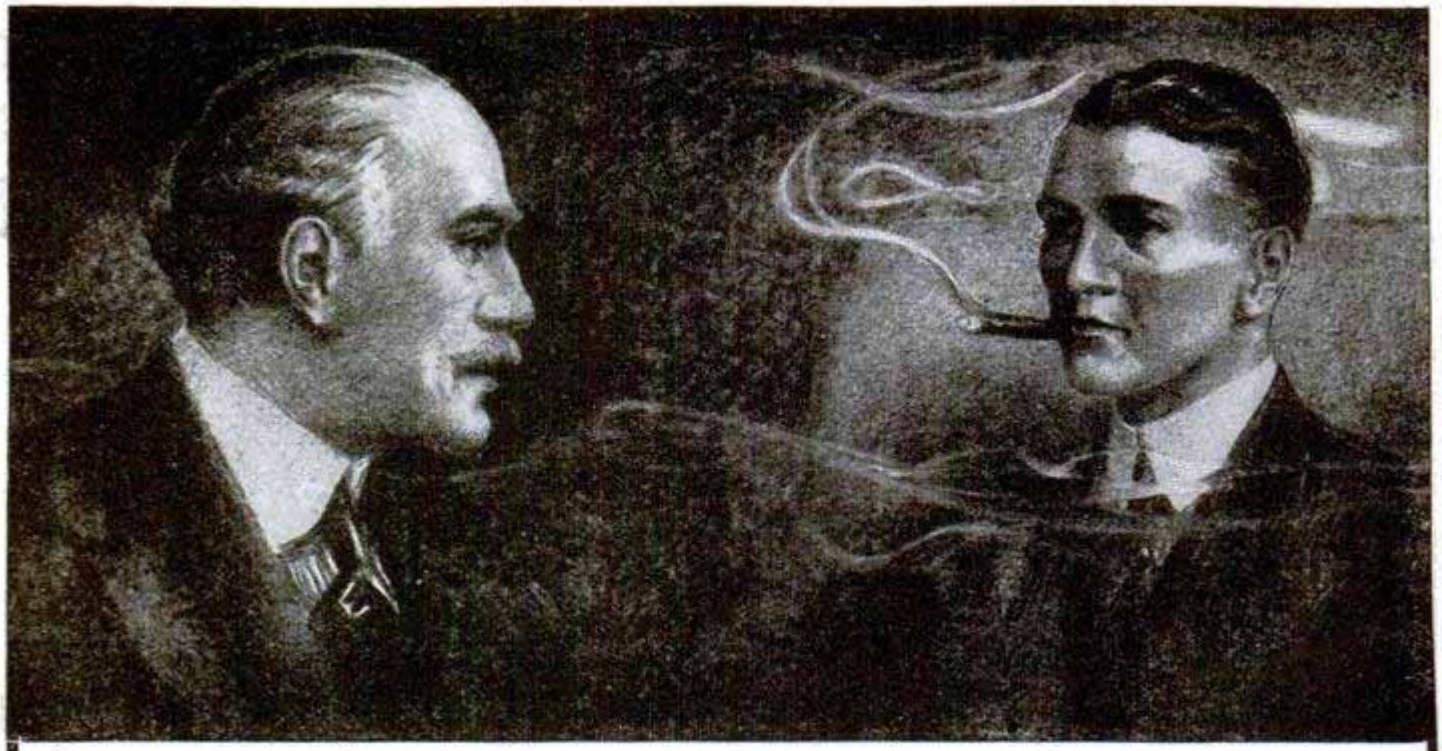

Tobacco Is Hurting You

Look at the facts square in the face, Mr. Tobacco User. You may think tobacco is not hurting you.

That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For **you** know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but **sure.**

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

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When your hands begin to tremble—
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then you have a right to suspect that TOBACCO is getting the upper hand.

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Let Us Help You

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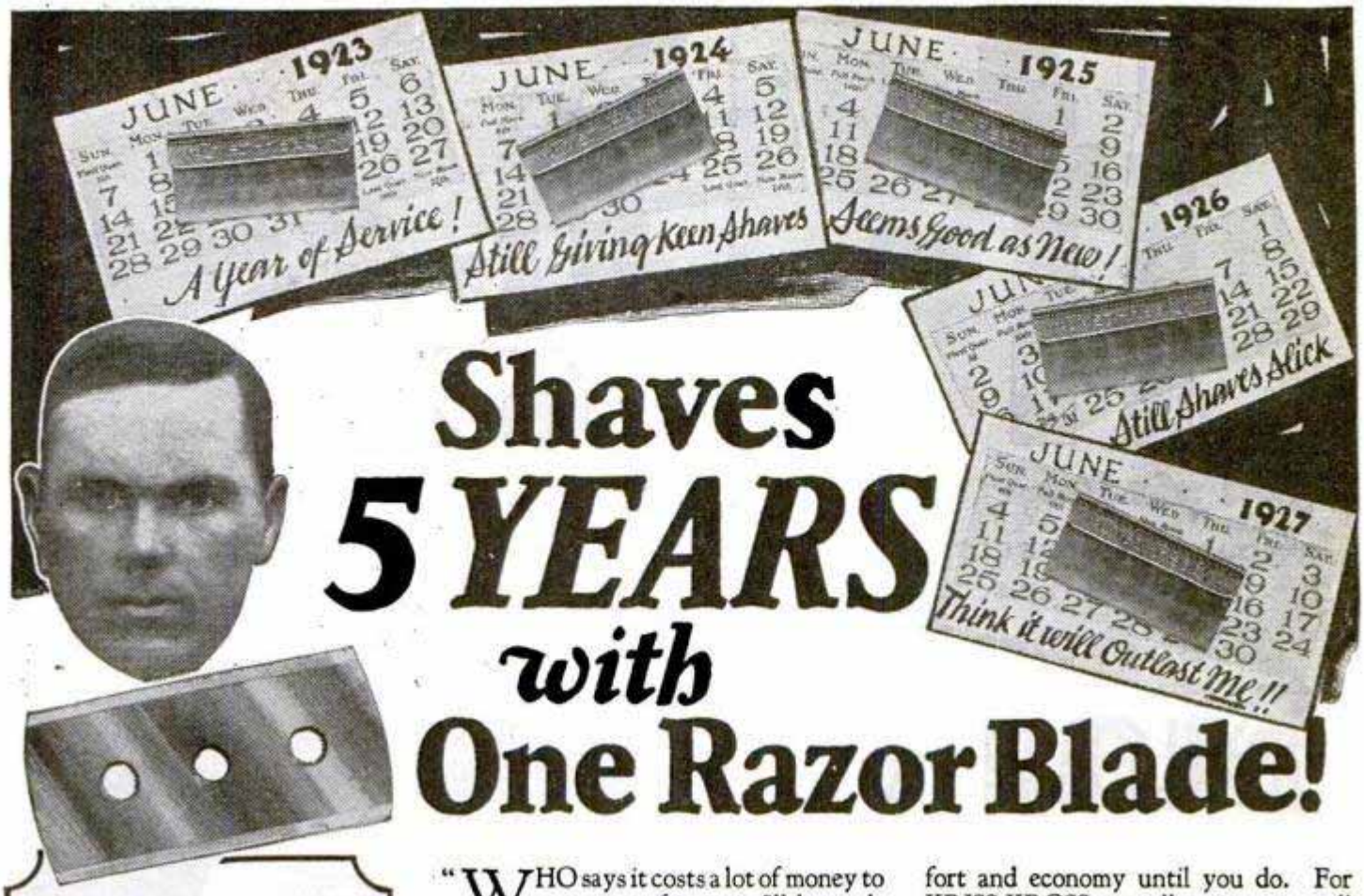

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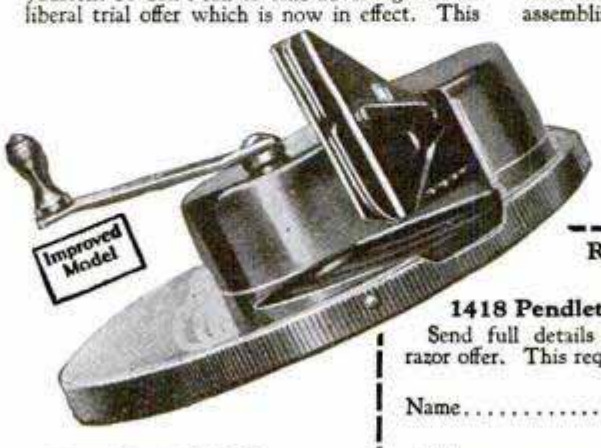

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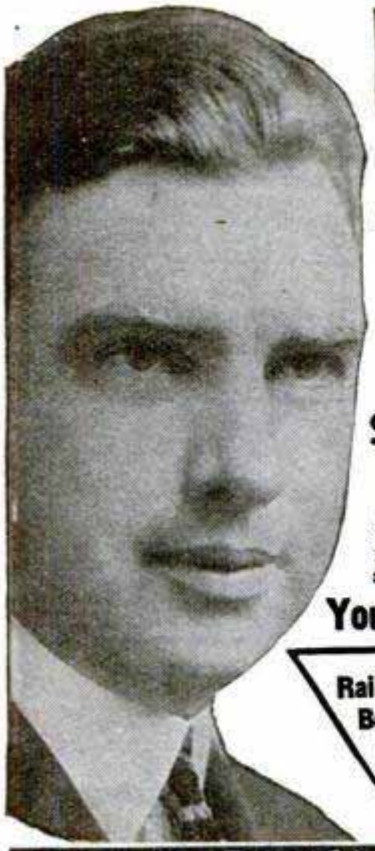

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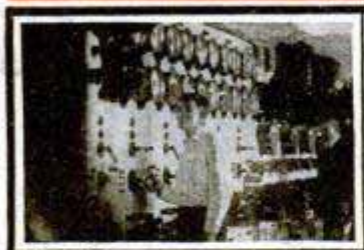

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WE Start You in Business, furnishing everything; men and women, $30.00 to $100.00 weekly operating our "New System Specialty Candy Factories" anywhere. Opportunity lifetime; booklet free. W. Hillyer Ragsdale, Drawer 4, East Orange, N. J.

SUCCEED With Your Own Products. Make them yourself. Formulas, Processes, Trade-Secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

LEARN the collection business. Good income, quick results. Interesting booklet, "Skillful Collecting" free. National Collectors Assn., Long St., Newark, Ohio.

BUILD your own business selling Annie Blain Flavors. New Repeat System. Geo. S. Parker, New Brunswick, N. J.

SELL By Mail. Wonderful opportunity. Particulars free. Mason, 3902 Broadway, Room 5, Chicago.

SELL By Mail. Wonderful opportunity. National Cutlery, Sta. V, Los Angeles, Calif.

BECOME Independent. Start a Mailing Service Business with almost no capital. I cleared $5,000 last year. Write for particulars. Keystone Mailing Bureau, Box 1032, Altoona, Pa.

KING System Mail Order Business, sample, details free. King Company, Box 6722, Wilmington, Del.

UNLIMITED Opportunities and mail order information 10c. Advance Company, Stillwater, N. Y.

SELL by Mail! Books, novelties, bargains! Large profits! Particulars Free! B-Elfco, 525 South Dearborn, Chicago.

BIG Bunch Mail, Year 15c. Catalogues, Magazines, Kentucky Agency, Covington, Kentucky.

ATTENTION! Establish for yourself new system real estate, brokerage and insurance agency; office at home; earn $5,000 year. Stamp free booklet. Hayes Realty Association, Cincinnati, Ohio.

AN Income from an acre of ground. No ginseng raising. Particulars, stamp. Geo. L. Brockman, LaPorte, Ind.

CIRCULAR Free. Learn how to sell novelties by mail under my instruction. Hadwil, 96A, 74 Cortlandt St., New York.

A BUSINESS of Your Own Making—Sparkling Glass Name and Number plates. Checkerboards, Signs. Big book and sample free. E. Palmer, 540, Wooster, Ohio.

TELEGRAPHY

TELEGRAPHY—Both Morse and wireless—taught thoroughly and quickly. Tremendous demand. Big salaries. Wonderful opportunities. Expenses low; chance to earn part. School established fifty years. Catalog free. Dodge's Institute, H St., Valparaiso, Ind.

CHEMISTRY

YOUR Chemical problems solved and working formula or process furnished for $5.00. Write me. W. Stedman Richard, Industrial Chemist, Box 2102, Boston, Mass.

CHEMICALS And apparatus. Price list 5c. George Ott, 1218 Chestnut, Reading, Penna.

FORMULAS AND TRADE SECRETS

ATTENTION! Attention! New, superfine, late, scientific, non-alcoholic lemon, orange, lime, maple and vanilla flavors. These are not gummy emulsions. Will not deteriorate. Easily made. No machinery required. Improve with age. Formulas for all with complete information $10.00. Any one flavor complete $3.00 each. Samples of these flavors made with same formulas will be sent for 25c. W. & E. Specialty Laboratory, 1067 Broadway, Buffalo, N. Y.

LATEST Valuable trade secrets, guaranteed formulas for starting world's fastest big money business making newest sure-fire specialties. All lines, small investment. Immense profits! Write immediately for eye-opening valuable literature. Miller, Chemist, 1706-E Jetton, Tampa, Fla.

LATEST Book of money making formulas and opportunities $1.00. No trash. August Scheiderer, Plain City, Ohio.

MANUFACTURING Ideas made practical. Chemical consultation and analysis. Money-making formulas. Charges moderate. Write Associated Chemists, Indianapolis, Ind.

MAKE And sell puncture stopper. Stops punctures without removing tube from tire. Easy to make, big profits. Formula $5.00. R. E. Matthews, Sherman, Tex.

EXPERT Chemical analysis and consultation at low cost. Formulas and processes $1. Stenton Laboratories, 2122 Griffith St., Philadelphia, Pa.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

SUCCEED With Your Own Products. Make them yourself. Formulas, Processes, Trade-Secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

INDUSTRIAL Chemist furnishes formulas, plans, trade secrets. All lines. Work guaranteed. Lists free. J. F. Mazur, 941 20th, Lorain, Ohio.

FORMULAS—170 Money makers and big illustrated catalog 20c. Ideal Book Shop, (K) Park Ridge, Ill.

AGENTS WANTED

AGENTS—I'll pay your bills, give you steady income for rest of your life, if you will take care of my business in your locality, full or spare time. You be my partner, make $15 a day, ride in Chrysler sedan. Distribute teas, coffees, spices, extracts, things people eat. I furnish everything; world's finest super sales outfit containing thirty-two full-sized packages; low prices; big repeat business; $25,000 guarantee on quality. I go 50-50 with you. Get my amazing offer. C. W. Van De Mark, Dept. 102-F, 117 Duane St., Cincinnati, Ohio.

CEE-DAR Kills moths, chases flies, mosquitoes, cockroaches. New form. No powder or liquid. Hangs on hook. Guaranteed. Repeater. Women buy one to six. Particulars free. Sample 10c. Cee-Dar, D77 W. Washington, Chicago.

$40 PROFIT The first day! That's what Murphy did with the new Perfo-Siphon, the fastest selling novelty of the year. Sells on sight to everyone using ginger ale or any carbonated drink. Makes a siphon of every bottle. Slipped on right over crown cap, it perforates it. Keeps contents full of sparkle for days. Nothing like it! $1.50 seller. Mail $1 for sample, or ask for full details. Vaughan Novelty Mfg. Co., Dept. A-135, 3213 Carroll Ave., Chicago.

"RIDE AIR" Men made $375,952.00 introducing this world-beating money maker the last 2 seasons. If you are not afraid to work 2 to 4 hours a day, I'll prove that $20 a day profit will be easy for you. No selling experience necessary. Sample free, and I mean just that! No strings to this offer—not a cent now or ever for the sample and full particulars. Address C. F. Hamilton, Dept. 15, No. 532 W. 27th St., Los Angeles, Calif.

100 MORE Active men to introduce "Chieftain" guaranteed tailored shirts, 3 for $4.95. Latest novelties, colors, styles. Dickman, Illinois, in 3 weeks made $589; Sinton, Texas, in 12 days, $219.60; Bend, Iowa, in 16 days, $334.80. Why not you? No experience or capital needed. We deliver and collect. Full working outfit free. Cincinnati Shirt Company, Shop 1586, Cincinnati, Ohio.

AGENTS: Fixit Rubber Repair is the wonder of the age. It is semi-liquid, chemically prepared pure up-river Para Rubber. Applied cold, without heat or tools, it quickly vulcanizes itself to tube or casing. Repairs punctures or blowouts. Agents make big money—best season now. Auto owners, garages, service stations, fleet owners will welcome the opportunity of saving 800% on tire repairs and of increasing mileage of their tubes and casings. Send $1.00 for full size sample or write for free particulars. Marquette Rubber Co., 2325H Wolfram St., Chicago.

DRINKS. The best you ever tasted, concentrated true fruit flavors, cherry raspberry, strawberry, grape, etc. Just add water and sugar. Can be kept on ice for a week. 30 quarts (150 glass size) $1.00; 3 for $2.50 postpaid. 80c clear profit on every dollar selling at 5c a glass—beautiful signs free. Also 10c packages soft drink powders, makes 10 big glasses delicious drinks. Big sellers to families and stores. Seven packages, assorted flavors (70 glasses), with full particulars, 50c postpaid. Chas. E. Morrissey Co., 4117 Madison St., Chicago.

PRIVATE Brand toilet articles, household specialties, perfumes, soaps, extracts, etc. We pack these goods for you under your private label. With your name on the goods you can get all the repeat business. Don't sell for others, but build up profitable business for yourself. Highest quality merchandise. Extremely low prices. Quick shipments on both large and small orders. Write immediately for lowest wholesale prices and complete information regarding our amazing offer. Address, Supply Department, National Scientific Laboratories, 1904W Broad, Richmond, Va.

WANTED! Ambitious, industrious person to introduce and supply the demand for Rawleigh Household Products. Good openings near you. Make sales of $150 to $600 a month or more. Rawleigh Methods get business everywhere. No selling experience needed. We supply Sales and Advertising Literature and Service Methods—everything you need. Profits increase every month. Low prices; good values; complete service. W. T. Rawleigh Co., Dept. 63PPM, Freeport, Ill.

AGENTS: Large profits selling our eighteen money-making specialties, including patented All-In-One combined cigarette and match case. Holds package cigarettes and box safety matches. Beautiful, compact, flexible container. Write today for complete information. All-In-One, Dept. A-6, 2810 Portland Ave., Minneapolis, Minn.

AGENTS: Make two dollars hourly. Sell new kind of sharpeners. Sharpens all knives, tools quickly. Demonstrating sample free. Premier Mfg. Company, Dept. 68, Detroit, Mich.

JUST Out—New Patented Apron. No strings or straps—$20.00 a day every day; over 100% profit; commissions daily. Write for free offer. Sta-Put Co., Dept. 206, St. Louis, Mo.

AGENTS—Best seller; Jem Rubber Repair for tires and tubes; supercedes vulcanization at a saving of over 800 per cent; put it on cold, it vulcanizes itself in two minutes, and is is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Philadelphia, Pa., Dept. 505.

EARN $15 Day selling No Touch Serving Forks; women buy on sight. Particulars free or $1 for sample. Du Pree Co., 608 Pacific Bldg., San Francisco.

NEW Invention—400% profit. Liquid quick mend for fabrics and hosiery. Stops runs. Every woman buys. Hundreds other fast sellers. J. E. Johnson Co., Dept. 466, 6129 Wentworth Ave., Chicago.

WOMEN—$2 An hour spare time; 100% commission; new idea sanitary necessity; sells on sight; every woman buys; new feature never before used; designed by physician; revolutionizes old uncomfortable methods; pay every day; no deliveries, no collections; no experience or capital required. Write Mary P. Coleman, Meriden, Conn.

AGENTS—Distributors. Whirlwind seller. Gas stations, dealers, drivers. "Miracle" windshield cloth. One wiping defies rain 24 hours. Amazing results. Retails 50c. Celco Chemical Co., 17th & Washington, Toledo, Ohio.

AUTOS Washed without water; amazing medicated cloth removes mud without scratching; 250,000 sold by agents; more wanted. Security Mfg. Co., Dept. 25, Toledo, Ohio.

AGENTS—Big profits selling stores 5c candy specialties. Colonial Co., 312 E. 33rd, New York.

SELL "Grip-It" screwdrivers. Holds the screw until it is started. Send 50c for sample and proposition and try it in spare time. Your profit 100%. Apex Stamping Co., Riverdale Station, Chicago, Ill.

BIG Money selling Sealair rubber weld. Sealair Rubber Co., Five Hundred Fifth Ave, New York.

WE Want more good salesmen for our men's neckwear and hosiery. Sell direct to wearer. Big values. Big profits. Write for $3.00 sample order C. O. D. Goods returnable. Radiant Neckwear Manufacturing Co., 1879-B Southern Boulevard, New York.

A NEW specialty that sells on sight. The handy hose holder fills every need for watering lawns or shrubbery. An ideal agent's proposition for summer. Big profits; protected territory; no money risk. Write immediately for particulars before the season gets under way. Practical Appliances, 45 Westbourne Terr., Brookline, Mass.

SALESMEN: We have liberal proposition for side line. Grower Products Co., 11 Portland St., Boston, Mass.

MAKE $11.00 Daily selling our Lucky 11 toilet goods assortment at $2.25 giving free 2 piece carving set. Each sale makes steady customers. Davis Household Products Co., 1205 Milton, Chicago.

SPINNING. Red white and blue auto light colors for cowl. See page 151 this magazine. Get in on ground floor.

AGENTS, Crewmen—Make big money! Handling our Mystic "Zippo"! Splendid profit on a snappy 50c "Go-Getter" repeat article sells on 10-second demonstration! Performs while you watch it! Demonstrates value while others make claims! Greatest scientific triumph of the age! Write immediately for proposition! Karam-Smith Company, 606 Bozan St., Fort Wayne, Ind.

AGENTS—Sell new auto spring oiler; attached instantly any make car. Increases riding comfort—tire mileage; prevents spring breakage. Over 100% profit. Liberty Auto Supply Company, Dept. P-1, Pomona, Calif.

GENUINE—Dupont Fabrikoid Tablecloths. No laundering, wash like oilcloth; look like imported linen. $75.00 weekly. Pay daily. Sample free. Dollette Corporation, C1018 Wabash, Chicago.

BIG Profits! Stop hosiery runs! Fast, easy sales; amazing needle re-knits stockings like new; every woman buys; carry supply in pocket; working sample offer. National Needle Co., 19 S. Wells, Chicago.

AGENTS Send for free sample "Fretnot." Washes clothes snow white without rubbing. $5.00 daily and more easily made. Credit given. Empire, 1549 N. Wells, Dept. 101, Chicago.

AGENTS—$13.80 Daily in advance, introducing new insured hosiery for men, women, children. Must wear or replaced free. 57 styles, 39 colors including latest "Silk to the Top" ladies' hose. Nyland made $595 in one month. Edwards, $460.60. Mrs. Bone, $425.45. Why not you? Even spare time should pay you $3.00 an hour. No experience needed. We furnish samples. Silk hose for your own use free. New plan. Write quick. Macochee Company, Park 2566, Cincinnati, Ohio.

$1 PAYS $20—Start the world's fastest big money making business. Make and supply agents, salesmen with new sure-fire selling specialties. Write immediately for eye-opening literature, describing guaranteed formulas, latest valuable trade processes. All lines. Small investment. Immense profits! Start anywhere. Miller, Chemist, 1706K, Jetton, Tampa, Fla.

MEN—You cannot sharpen a razor blade without honing it. "Zip" Safety Razor Stroppers; hone and strop in one operation. New principle; automatic master stroke; positive hone. Superior to all other stroppers; lasts lifetime. Retails $2.50. Write for free offer. Commissions daily. "Zip" Inc., 413 E. Stark St., Dept. M, Portland, Oreg.

NO Peddling. Start own business. Home, office. Free folder describes 27 money making opportunities. No outfits. Elite Co., 38 Elizabeth St., New York.

A RELIABLE firm wants few more lively agents. Brilliant proposition that will help you to convert your spare time into money. We furnish sample. Write for particulars. Tampa Habana Industrial Co., Box 5147, Tampa, Fla.

AGENTS—Just out. Whisper your talk over telephone. 100% profit. Every telephone a customer. Immediate sales on demonstration. Sample one dollar. Whisper Phone, Long Island City, N. Y.

AGENTS: Wanted for imported novelty pocket knife used as cigar cutter, twine cutter, nail cleaner, manicuring, etc. Sells easy for 50 cents each. Cost you $2.00 per dozen. Send 25 cents for sample. New Transit, 464 West 23rd St., New York.

MEN—Women, $1.80 an hour. No less. Large Mfg. Co., established 30 years. Starting new medallion dept. Amazing new sales plan. First 22 agents average $1.80 an hour steady. Only 1 agent wanted in locality. Your own photo free as sample. Art Medallion Co., Dept. 77, Corner Campbell and Jackson, Chicago, Ill.

AGENTS — Something new. $75-$200 weekly selling $7.50 washing machine. Does work of high-priced machines. Biggest profits. We deliver—collect. Free sample offer. (Weight 4½ pounds.) Act. Merle Mfg. Co., (Manufacturers), Desk 4C, Aurora, Ill.

HOUSEWIVES Can't resist buying "Kleanezy." New patented self-wringing mop. We prove it's the biggest money-maker and the best mop made by sending sample on approval. Kleanezy, Dept. G-20, Delphos, Ohio.

STRANGE Invention! Pays $25 daily; keeps telephone and iron cords from tangling and kinking. Prevents iron scorching. Saves electricity. Sample free. Neverknot, Dept. 6-A, 4503 Ravenswood, Chicago.

FLAVORING Extracts—Bottle yourself! Concentrated, add water. Free labels, whirlwind sellers! 500% profit! Moneymaking opportunity. Write Thomas Manufacturing Company, Indianapolis, Ind.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

BIG Pay every day! Complete guaranteed line direct to wearer, dress shirts, work shirts, overalls, coveralls, work pants, underwear, sweaters, playsuits. $10-$15 daily. Experience unnecessary. Big outfit free! Nimrod Co., Dept. 8, 4922-28 Lincoln Ave., Chicago.

AGENTS $240 Month. Dri-Kleanit removes dirt, grease, tar, all one operation. Cleans car for 10c. No soap or water used. Car looks like new. Wonderful seller. Free sample. American Accessories Co., Desk 2631, Cincinnati, Ohio.

ANY Salesman can earn $75.00 to $200.00 a week selling our patented real art genuine gold leaf window letters. No experience necessary. Sell on sight. Big demand all year round. Any one can put them on. Buy for cash and sell for huge profit. General agents can collect big commission on original and repeat business. Free liberal samples. Write today for complete proposition. The Tablet & Ticket Co., 1015-1021 West Adams St., Chicago, Ill.

AGENTS $240 Month. Sell finest line silk hosiery you ever saw. Auto given when earned. Free silk hosiery for your own use. Write today for samples and state size of hose worn. Betterknit Textile Co., Silk, 2631, Greenfield, Ohio.

AGENTS Wanted—$50-$75 weekly. New patented ironing board covers. Other fast selling novelties. Samples free. American Braiding Company, 329 W. Monroe, Dept. K, Chicago.

MAKE Money—Spare time. Men, women, boys, girls. Easiest method; absolutely something different. No selling; no canvassing. Free particulars. Federal, 561 AA Broadway, New York.

AGENTS Make big money. Sell magnetic run and patch needle; also straight needle. Every woman buys. Wonderful samples sent. Diamond Specialty Co., Dept. C, 5851 Wentworth, Chicago.

$15 A DAY Sure. Sell guaranteed solid leather shoes. Unequaled low prices. 85 styles; men's, women's, children's. Free outfit offers complete line shoes, raincoats, leather coats, puttees. Consolidated Shoe System, Dept. 615, Eau Claire, Wis.

IF We send you two of our newest inventions—Wringer and Dust Mop—will you demonstrate and take orders? Every housewife eager prospect. Pays $75 weekly. No money required—samples loaned free. Write Delphos Mop Co., 1016 Washington, Delphos, Ohio.

THE Christensen Mop Wringer rubs, scrubs, cleans the mop. For sale by H. K. Christensen, Fort Atkinson, Wis.

WHY Sell Non-Essentials? Home necessities repeat. Duo Double Strength Extracts, toilet articles, full line of specialties, can't be beat. Big profits. Write quick. Duoform Co., N-1, Attica, N. Y.

AGENTS: Make $3.00 an hour taking orders for our 40 fascinating kitchen specialties. No competition. Write quick. General Products Co., Dept. F207, Newark, N. J.

COME To work with us—New spring outfit ready. Our agents make $15 daily selling shirts, underwear, sweaters, raincoats, boys' suits, hosiery. Northern Sales, 101 S. Wells, Chicago.

$75.00 WEEKLY Demonstrating and distributing Rich's soft drink powders to homes and stores. Southern agents selling 30,000 monthly. Wonderful apportunity. Sample free. Sol G. Rich Co., 622 S. Sangamon, Chicago.

AGENTS Wanted—Make $250 weekly selling rare quality products to homes or stores. Big demand; repeaters—profits. For details send us your address. Continental, 47-G West 45th St., New York.

DISTRIBUTORS—84 Page wholesale supply source. Directory offers unlimited opportunities. Pruitt System, Brookfield, Ill.

AGENTS—Men and women now earning $75 a week with Hoyt's foods, soaps, toiletries, necessities. Nobody needs experience. Our plan is different. Insure a big, steady income. Join us. Ask for free sample case offer today. Hoyt Bros., Inc., Dept. 92, Newark, N. J.

SELL Supreme No-Cement tube and tire patches. 310% profit. Particulars. Write Supreme, 135 Winder, Detroit, Mich.

RE-NU-A-TIE Tie tree. Removes wrinkles, keeps ties like new. Automatic, instantly adjustable any size. Agents' proposition, sample 25 cents. Re-Nu-A-Tie, 9 Newbury St., Boston, Mass.

WELLS Cleared $620.00 in one month with "Business Guide" and free legal service. Write for free outfit. Prof. Nichols, Dept. 8, Naperville, Ill.

CATHOLIC Representative wanted in every city and town in the country to take orders for brand new novelty which has direct appeal to every Catholic heart. Calnan Hennessey, 27 Haymarket Square, Boston, Mass.

AGENTS And salesmen wanted, easy making $15.00 daily and how, selling men's imperfect hosiery and neckwear, everybody needs; cost $13.20 gross pairs $15.00, $22.20, $24.00, $27.00; neckwear $7.20 gross $12.00; send today $10.00 for 7 doz. assorted samples. Very good opportunity. Lewis Hosiery Co., 12 N. 3rd St., Philadelphia, Pa.

AGENTS—150% Profit selling the Hel O Pad. Just out, the fastest selling specialty on the market. Every telephone a prospect. Send $1.00 today for sample and complete information. The Hel O Pad Co., Dept. P, Cumberland, Md.

ANTI-GLARE Headlight attachment. Takes glare out of headlights. Makes night driving safe. Increases light efficiency. Agents wanted. Retails $1.50 per pair. Anti-Glare Attachment Co., Box 97, Sapulpa, Okla.

FREE "Guide to a full pocketbook." New ideas, original business plans, money making secrets, other valuable information. Elite Co., 38 Elizabeth St., New York.

GENUINE Proposition for serious workers. Changeable signs sell readily to storekeepers. $1.50 size costs you 35c-50c. Two samples $1.00 postpaid. Also embossed showcards. Catalog. Free sample. Changeable Sign Co., 379 Logan St., Brooklyn, N. Y.

ATTRACTIVE Auto emblems, embossed, engraved; never tarnish. Belle Mfg. Co., 96 Friendship, Providence.

AGENTS, 80c Profit per dollar. French toilet preparations, food products. Particulars free. Rene Products Co., 137 Broadway, Chicopee Falls, Mass.

NAM-O-LENE—New, self-selling auto wonder—300%—Prepaid—Free sample. Diamond Spear, Texarkana, Ark.

BARGAIN Lots of chemical specialties for less than production cost. Big profits, list free. Peoples Chemical Laboratory, 2519 So. Crawford Ave., Chicago, Ill.

GENTS Felecia Cigar Lighter. Best patented lighter on market. Clean up $50.00 daily. Sample $1.00. Hamburg Import Company, 27 West 33rd St., New York.

QUARTER Sellers. Every housewife, automobilist buys. Quick demonstrations. Big profits. Write. Home Appliance Company, Ellisburg, N. Y.

AGENTS—Make $20 daily. Wonderful article. Amazing new profit opportunity. Women buy quickly. Orders repeat. We deliver and collect. Write quickly. Knights Mfg. Co., 37 Hamilton Blvd., Buffalo, N. Y.

ENGRAVED Nameplates, signs, numbers, initial, desk, city nameplates. Big profits. Hilton Specialty, 90 Stewart, Providence, R. I.

NEW! Patented automobile washing mop; tubular handle; attaches any hose; no splashing. Enormous demand. No competition. Amazing proposition. Federal Specialties Co., 1325 Sheridan Ave., Pittsburg, Pa.

MEDALLION Agents—Everybody is a prospect for photo medallions, jewelry, compacts, mirrors, photo novelties, etc. Make bigger profits; full time or sideline. Write at once for catalog and plans. Medallion Novelty Co., 208 Bowery, New York, Dept. P.

$5,000 A YEAR—Selling Perry Photo Medallions. Big demand. Ready sales. 400% to 600% profits. Any photo copied perfectly on medallions, mirrors, compacts, jewelry, etc. Guaranteed likeness. Investigate. Free catalog, full details on request. Write today. PM. Perry Photo Novelty Corp., 1793 Jerome Ave., New York.

AGENTS—$240 Month—Biggest line guaranteed cutlery ever offered. Knives, razors, etc. Exclusive territory. Extra commission. Big money for spare time. Write quick. Novelty Cutlery Co., Desk 1831, Canton, Ohio.

THE Latest, most amazing products! 200% to 500% profit! Make them yourself. Write for free, valuable literature. Scheld, Chemist, Box 1199, New Haven, Conn.

MIRRORS Resilvered at home. Costs less 5 cents per square foot; you charge 75 cents. Immense profits plating autoparts, reflectors, tableware, stoves, refinishing metalware, etc. Outfits furnished. Details free. Write Sprinkle, Plater, 128, Marion, Ind.

WHY Not sell us your spare time? $2.00 an hour, $19.70 daily easy full time. Introduce 12 months guaranteed hosiery—47 styles, 39 colors for men, women, children, including latest "Silk to the Top" ladies' hose and men's fancies. No capital or experience needed. We furnish samples. Silk hose for your own use free. New plan. Milton Mathews, Park 5866, Cincinnati, Ohio.

MAKE Big money selling tires, all or part time. Handsome profits; sell your friends; buy your own tires and save the middleman's profit. Guaranteed 15,000 miles. Write at once for territory and full details. Acme Supply Company, Lafayette, Ind.

FREE Sample! Colored embossed signs will make big money for you. 500% profit. Ever-Ready, 52-A, East Ninth St., New York.

AGENTS Become a regular established McConnon dealer! Buy on credit; sell for cash or credit. 228 absolute household necessities; all repeaters. Enjoy a sure income 52 weeks per year, year after year. City or country trade. Capital, experience unnecessary. McConnon & Co., Dept. S76, Winona, Minn.

AGENTS—200% Profit selling heatless solder, cement glue, rubber repair kits. Every home, office, garage needs, buys. Marvel, 401 Broadway, Dept. 38, New York.

AGENTS—Just out! $8.88 for men's suits. Anyone can sell. Commission $3 in advance. Free sales kit. 888 Company, Dept. FC-7, Fort Wayne, Ind.

AGENTS Wanted everywhere to sell Keeps Kleer. Every home and store a prospect. Brings in the money and they come back for more. Big profits; carry stock in your pockets. Get aboard a winner; write today for proposition. Keeps Kleer Co., Inc., 208 Powell St., San Francisco.

GET This! $100 auto necessity. 100% profit. Repeats like gasoline. Guaranteed. Taylor Products Mfg. Co., Columbus, Ohio.

GOLD-LEAF Window letters and script signs. No experience; 500% profit. Samples free. Meyer writes 5 days profits $141.36. Consolidated, 69-T West Van Buren, Chicago.

BIG Commission! Wallstipplers! Competitionless! Sell to painters and trade. Need no experience. Sells for $5—$2 profit! Waldeco-Stippler Manufact., 170 So. van Dien Ave., Ridgewood, N. J.

MAKE $50 To $75 a week. Everyone needs shoes. Sell Mason's all-leather shoes, amazingly low prices. 85 styles—men's, women's, children's. No experience needed. Big outfit free. Mason Shoe Mfg. Co., Dept. 226 Chippewa Falls, Wis.

CAN You sell a washing machine for $9.75? Agents are making $75.00 to $300.00 weekly showing new automatic washer to housewives. Thoroughly cleans and sterilizes. No rubbing necessary. Write for protected territory. Storm Royalty Co., Inc., 3601 Enright, St. Louis, Mo.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

MAKE $2.00 Every hour. Sell every home wonderful preparation; mends hosiery and clothing without sewing, invisible. Results guaranteed. Send for free sample of work. Queen City Laboratories, Dept. PM-6, Cincinnati, Ohio.

RELIABLE Men, full or part time. Sell every merchant printed necessities. Low prices. Handsome commissions. Free outfit. Experience unnecessary. Kaeser & Blayr, 72 Murdock, Cincinnati, Ohio.

AGENTS—Sell Trousers' Friend. Keeps trousers spick and span. Sells easily. 100% profit. Trousers Friend, Dept. 1, Box 521, San Francisco, Calif.

WONDERFUL Opportunity for entire summer. $5.00 per hour Saturdays, Sundays, spare time. No experience required. Free booklet. Benson Camerascope Co., 23-K, Delancey, New York.

DISTRIBUTING Agents for "No-Name" powdered hand soap; removes anything from hands. Free samples get business. 100% profit. Brackman Co., 2638 So. Trumbull, Chicago.

NO Dull times selling food. People must eat. Federal distributors make big money; $3,000 yearly and up. No capital or experience needed; guaranteed sales; unsold goods may be returned. We furnish you with sample case, license and free samples for customers—Sure repeat orders. Exclusive territory. Ask now! Federal Pure Food Co., A2307 Archer, Chicago.

AGENTS $240 Month. Bonus besides. Sell finest line silk hosiery you ever saw. Producers earn auto. Credit given. Write for samples. Wilknit Hosiery Co., Dept. 4831, Greenfield, Ohio.

AGENTS: Liberal commissions and bonuses selling high quality hosiery, handkerchiefs, scarfs, men's ties, curtains, bedspreads, linens. Also a big line of dress goods, silks, etc. 1,000 samples furnished. Write quickly. The National Importing Co., 573 Broadway, Dept. F-100, New York, N. Y.

LADIES Or gents need no capital or experience. Sample case of face creams, etc., free. Special offer 60% commission with this add. Pure Drug Products Co., Station "D," Cincinnati, Ohio.

$61.50 WEEKLY Introducing and selling a new gas light burner for kerosene lamps. No chimney. No mantle. Samples free. Luther Mfg. Co., Dept. 624, Cincinnati, Ohio.

AGENTS, Men and Women—New spring and summer line ready. Raincoats, underwear, shirts, sweaters, house dresses, hosiery, playsuits. Big commission. Catalog free. May Co., Pancoe Bldg., Chicago.

WE'LL Pay hustlers $75 up weekly selling our electric flashplugs, cigarette and gas lighters, pencillighters. Sample lighter and rapid-fire selling plans 25c. Details free. Elbee Trading Co., 799T, Broadway, New York.

SELL Gillette style razor blades. Good seller. Package 10 blades 35c; 200 blades, $3.50. J. Kramer, Iselin, N. J.

SELL All merchants and manufacturers everywhere, $1 profit each sale. Four samples 2c stamp. L. T. Norton, 45 Richton Ave., Detroit, Mich.

WORLD'S Fastest selling specialties for agents. Write Gilsud Co., 325 South Flower, Los Angeles, Calif.

SELL—Wire stretching, splicing and fence repairing tool. Wonderful proposition. Hawbaker Co., Elmore, Minn.

NEARLY Everyone wants Lindbergh souvenir medal. Thousands carried as lucky pocket piece. Fast sellers. Good profits. Particulars free. M. W. Smith-1, Millville, N. J.

AGENTS: We have whirlwind. Get details. Webster, 608 Wrightwood, Chicago, Ill.

75c PROFIT On $1.00 sale. Auto furniture and glass cleaner. Your name on label. Exclusive rights. Free sample. MFG. E. 213 Griswold, Detroit, Mich.

SURPRISE Housewives! Leaky utensils repaired free instantly. Knockout demonstration sells Mendets amazingly. Twelve dollars daily easy. Free samples, selling secrets. Get territory quick. Collette Mfg. Co., Dept. 7A, Amsterdam, N. Y.

SELL Wonder Cleanser—The great chemical discovery. For laundry, floors, dairy utensils, etc. Revolutionizes housework. Big 12 oz. boxes. Amazing profits. Samples free. Write quick. Duoform Co., Dept. WC-1, Attica, N. Y.

EXPENSIVE Silk dresses. Our slightly handled showroom samples sold cheap. Peddlers, storekeepers, ladies with home dress parlors, etc. Write Hirschlar's, 219 West 34th, New York.

AGENTS—$25 Daily selling men's neckwear, rayon underwear direct from manufacturer. Send for particulars. Wepteen Mills, 67 East 8th St., New York.

AGENTS, Sell the automatic stairway switch, guaranteed. You can't forget cellar lights. Prevents accidents, saves electricity. Sample $3.50; sells for $7.30. Stairway Switch Co., Glenside, Pa.

AGENTS, $75 Weekly selling latest embossed card-signs, two-color show cards, changeable signs, flashing plugs. All merchants buy. Franklin Co., 3322 3rd Ave., New York.

ENERGETIC Salespeople. New household device softens, filters water; $20 day easy. Aluminum doughnut baker, wonderful seller. Samples $2.00 each. Research Laboratories, Savage, Minn.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 32.

A BUSINESS of your own—Making sparkling glass name and number plates, checkerboards signs. Big book and sample free. E. Palmer, 512, Wooster, Ohio.

32 SECONDS Complete tire change by Detmer, Ohio, with Morey Quick Action Rim Tool. Sold, singly, 49 three days, cleared $100. Anderson, Mont., sold 1,400 in 14 weeks. Get details for good territory. Harvest time now. M. Morey Rim Tool, Buffalo, N. Y.

AGENTS: Portraits, photo-pillow tops, frames, sheet pictures, medallions, photo-jewelry, guaranteed hose, laundry tablets, food products, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30-days' credit. Jas. C. Bailey Co., Sta. C-6, Chicago.

$50,000 PICTURE Man Friedman made canvassing. Beginners can make $100.00 weekly with my sales talk. Experienced men make more. Free book. "Profits in Portraits" explains. Sample free. Picture Man Friedman, Dept. 8-H, 541 W. Lake, Chicago.

NEW Unusual necessities paying phenomenal profits. Make money as you've never made it. Unequaled, amazing detailed offer, free. Concentrated Products Co., Box 3772-P, Tampa, Fla.

MAKE More Money. Sell Lab. polishing cloths. Big profits. Sample free. McCann, 2771 Morris Ave., New York.

ABSOLUTELY New article of universal daily need; big profits; no competition; repeater; free sample. Magic Products, Dept. 418, 332 East 31st, Kansas City, Mo.

3 AGENTS In the $250 a week class. Stuckey Novelty Works, Bogan Lane, Alexandria, La.

AGENTS—Sell Ball Grip Automobile Patching. Good commission. McNeill, Waterloo, S. C.

I PAY my agents $90 weekly commission just to wear and show my beautiful new free raincoat and give away free hats. Write today for yours. Robert King, 230 So. Wells, Dept. AA6, Chicago.

AGENTS—For "Aladdin" polishing cloth. Enormous demand everywhere; 200 per cent profit. Sample free. L. Dougherty, 518 West 39th St., New York.

SOMETHING New! 100% sanitary rubber milk bottle stopper—seals bottles airtite. Sample, particulars 10c, dozen 60c, gross $5.00 postpaid. Sale guaranteed. Wright Specialty Co., 1040-M, South Broadway, Los Angeles, Calif.

AGENTS—If you need money write for free sample So Easy Mystery Polishing Cloth. Mohler, Box 453A, Chicago.

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

WE Trust Agents!—Starter Stock and Reorders on Credit—no bond signers. Finest line 200 guaranteed Extracts, Pure Foods, Toiletries. Big Profits. Write for details. Perkins Products, E-3, Hastings, Nebr.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Murphy, Chemist, Tujunga, Calif.

WE Have the finest needle case, self-threading needles, needle threaders. $50.00 to $200.00 weekly. Samples 25c, particulars free. Empire, 1549 N. Wells, Dept. 201, Chicago.

WRITE Atlas Sign Works for free working equipment. Beautiful window sign letters. Penny each! Any size. Wonderful offer to general agents. K1032 E. 55th St., Chicago.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods, Experience Unnecessary. Carnation Co., 2480, St. Louis, Mo.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name and address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H. Decatur, Ill.

AGENTS—Here's a New One. "Bestever Powdered Hand Soap." Sells like wildfire. Marvelous Discovery. Removes grease, paint, ink, oil, in fact anything from hands. Cannot harm skin. 150% Profit. Great Repeater. Agents simply coining money. "Free Samples Get the Business." Write immediately. Bestever Products Co., 4315W Irving Park, Chicago.

AGENTS: To sell our new metal folding hat and coat hanger; every home or office will buy it. Bd. Gause Mfg. Co., Elkhart, Ind.

SELL "Lustra" Polishing Cloth, rapidly replacing metal polishes. Great sideline—sample free. Schrieber, Nashville, Ill.

POLMET Polishing Cloth removes tarnish from metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retails 25c; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instruction or write for free book "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 140 and 141.

MAKE Big money. Be the electrical dealer in your town. Sell a big line of low priced, quality appliances. Write for our selling plan. Dandyline Products, 4420 N. Western Ave., Chicago, Ill.

AGENTS—New Invention! The Perfect Tie Catch. A necessity, makes wonderful demonstration. Sample 10c. Write for particulars. Novelties, Room 420, 1265 Broadway, New York.

AGENTS—Sell stores 5c candy Specialties. Lerrac Products, Albany, N. Y.

$16 A DAY Easy—I start you in auto accessory business; no investment; no experience necessary. Landin, 4206 Montrose Ave., Chicago.

$10 DAILY. New, highly practical, useful 50c article for every home and office. Sells on sight. Hydrawlik Corp., Roselle, N. J.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

MONOGRAM Automobiles, $1.35 Profit ten minutes' work; every owner wants them; millions without; particulars free. Motorists Accessories Co., Mansfield, Ohio.

AGENTS — Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marui Company, Tribune Bldg., New York; N. Y.

GET Our Free Sample Case—Toilet articles, perfumes and specialties. Wonderfully profitable. La Derma Co., Dept. A, St Louis, Mo.

AGENTS make $100 week furnishing Cigar Lighters to merchants on free advertising plan. Particulars sent free, write at once. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

$1,000.00 REWARD if this is not the greatest money-making house to house proposition ever known. N. R. G. tablets wash clothes in 10 minutes without rubbing. Free Samples. N. R. G. Co., H232 W. Superior, Chicago.

SHOW Us the housekeeper who likes to clean stair corners. Earn big money installing Ideal Corner Dust Shields. Write today. Ideal Stairway Equipment Co., Canton, Ohio.

SOMETHING New. Every motorist a buyer of our electro-magnetic-emergency Wonderlamp; takes only one minute to demonstrate and make a sale; no experience necessary; $5.00 an hour easily made; full time or evenings. Write for sample. Wonderlamp Co., 926 Fisk Bldg., Dept. 10-A, New York.

TIRE Agents—Car Owners. $5 to $10 allowed on old tires, free 7 day mileage test on new Mellinger heavy duty tires. 15 months guaranteed, free tire offer to agents. Make $50 weekly spare time. Write for amazing offer, powerful selling kit given agents and wholesale prices. Mellinger Tire Co., Dept. 282, Kansas City, Mo., Warren, Ohio, Oakland, Calif.

AGENTS Wanted to sell Men's Hats direct from factory. Write for catalog. Model Hat Mfg. Co., Dept. M-14, East Orange, N. J.

OUR Luminous Crucifix Shines in the Dark. Every one amazed at the wonderful effect. Easily demonstrated—easily sold. W. G. Hannan Co., 2543 So. State St., Chicago.

AGENTS—Engraved name plates, signs, numbers, etc., easily sold, profits large. Brett Bros., Roxbury Crossing, Boston, Mass.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

SUCCEED With Your Own Products. Make them yourself. Formulas, Processes, Trade-Secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

EASY Money—$50.00 to $150.00 weekly selling "Jiffy Huller," a device every housewife wants. Saves time and labor shelling peas and beans. Retails $1.00. Commissions 90% to 140%. Send $1.00 for demonstrating model. Jiffy Specialty Co., Marietta, Ohio.

AGENTS make $10.00 Daily selling Non-Splash Water Filters on sight. Best canvasser's article on market. Investigate. Write for particulars, Desk 14, Seed Filter Company, 73 Franklin Street, New York.

FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom People, 147-C New Jersey Ave., Brooklyn, N. Y.

REPLATE brassy worn-off Automobile Parts, Reflectors, Bath Room Fixtures, Worn Spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. $1.00 half pints. Post Paid. Satisfaction Guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

$50.00 WEEKLY easy, Applying Gold initials on Automobiles. No experience needed. $1.45 profit every $1.50 job. Free samples. "Ralco Monograms," X1043 Washington, Boston, Mass.

WANT Distributing Agent for Handslick, powdered hand soap; removes anything from hands; everybody a customer; sample free. Solar Products Co., J-2142 S. Troy, Chicago.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

TWO Money makers for agents. "Francia" Pocket Adding Machine retails $4.85. To you $1.00. "Excellograph" Rotary Stencil Duplicator $37.50 retail. Write Typewriter Supply, 102 Hersch Bldg., Pittsburgh, Pa.

HANDSOME Profits supplying leading self-repeating auto necessity; no competition; pay daily; write today; best season. Topco Mfg., Dept. X Sta. H, Cleveland, Ohio.

THREAD-CUTTING Thimble 25c. Seller Sample 15c. Irvel, 3973 Elston, Chicago.

AGENTS Wanted—One minute demonstration sells it; startling new glass cleaner for windows, windshields, showcases, mirrors. Send 30 cents for sample. Fenton Co., 3744 78th St., Jackson Heights, New York.

KWIK Straw Hat Cleaner is demanded by millions. Need more agents. Allan, Harahan, La.

BIG Money selling 25c article you make yourself. Costs you 5c. No license required. 25c pkg. free. C. C. Manufacturing Co., B-522, Dayton, Ohio.

MAKE And sell your own goods. No machinery. Guaranteed formulas. Catalog free. Clover Laboratories, (E) Park Ridge, Ill.

AGENTS—100% Profit demonstrating a new product! Surfacine keeps metal surfaces free of rust and gives furniture and woodwork a semi-permanent polish. The Surfacine Co., 3123 W. 22d St., Chicago, Ill.

$31.00 PROFIT—with $1.50 Outfit—Big Money—Easy Work. Selling Gold Monograms for Automobiles, Luggage, Windows, Wagons. No Experience. No License. "Samples Free." NuLife Monograms, Hartford, Conn.

AGENTS—We start you in business and help you succeed. No capital or experience needed. Spare or full time. You can earn $50-$100 weekly. Write Madisen Company, 566 Broadway, New York.

GRAND Opportunity, 150 fast sellers; 50% commission and valuable premiums given free to active agents. Send for special sample case offer. Colonial Chemical Co., Pittsburgh, Pa.

COUNTY Agents Wanted. 50% commission on tried and proved automobile spring oiler. Nothing else like it. Sells on sight—every motorist wants them. This is a good proposition; don't pass it up. Send for full particulars. Harvey Spring and Forging Co., Racine, Wis.

WRITE For New Low Prices, direct from manufacturer, Flashy Felt Rugs. Attractive colors and patterns. Popular size $13.50 dozen. Sample Rug $1.40. Newark Felt Rug Co., 416-F Morris Ave., Newark, N. J.

AGENTS—Mosco Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Co., 403 Searle Bldg., Rochester, N. Y.

STOP: 300 Fast-selling specialties from many parts of world. Proposition hard to beat. Write for Free Wholesale catalog. Spors Co., Lesueur Center, Minn.

MANUFACTURE Radiant glass name and number plates, mirrors, signs, etc. Besides teach others! Investigate! Radiant Signs, 15905 Alden, Detroit, Mich.

$75-$200 WEEKLY. Genuine gold leaf letters for store windows, easily applied. Get the styles good sign painters use. Sign Painters Letter Co., 11416 Forest Ave., Chicago.

HERE It Is—newly invented auto necessity that goes big with new Ford; particulars free. Suburban Box 10, Mt. Washington, Ohio.

WIDESPREAD Demand for Our New Food Drink and new Flavorings (Black Walnut, Peach, Dixie Bouquet, etc.). Many other fine products. More agents needed. Blair Laboratories, Lynchburg, Va.

INSTANT Weld Welds Rubber Instantly. Stock's Profit One Day $72.25. Enormous demand. Exclusive territory. Free sample. Tourists Pride Manufacturing Co., Desk G, Minneapolis, Minn.

AGENTS And Mail Dealers cleaning up with Lanowa Combination. 200% profit. Everything furnished. Write quick for sample. Fraser Products, 212-J Westport, Kansas City, Mo.

CALIFORNIA Perfumed heads selling like hot cakes. Agents coining money. Big profits. Catalog Free. Mission Factory P, 2328 W. Pico, Los Angeles, Calif.

PHOTO Medallion Men and Women, the largest line of Photo Novelties in the world. Lowest prices, quickest service. Send for catalogue showing over 200 money makers, Photo medallions, photo medallion clocks, photo mirrors, photo fountain pens, photo powder compacts, photo jewelry and photo buttons. Gibson Photo Jewelry Co., 608-614 Gravesend Ave., Brooklyn, N. Y.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

SEND name, address on postcard. Free introductory copy Modern Salesology Magazine; 1000 money-making opportunities offered by big reliable firms; no obligation. Salesology Magazine, Desk B-38, 500 No. Dearborn, Chicago.

AT Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds and deceives. Beautiful case free, $100 weekly. Rajah Diamond Company, F20, Salisbury, N. C.

SELL men's neckwear; wonderful proposition. Astor, 318-M Broadway, New York.

15c PROFIT On every 25c sale. Box 500, Shreveport, La.

AGENTS—Brush and Broom Catalog with sample Case Assortment of 50 different kinds of Brushes sent without deposit to responsible Brush Salesmen. National Fibre Broom Co., St. Louis, Mo.

HIGH-GRADE SALESMEN WANTED

SALESMEN Now calling on garages, accessory and other dealers to introduce the revolutionary new way of cleaning and polishing motor cars that's being adopted by garages and car owners throughout the country; because it is quicker, easier to use, and most important of all it costs only one-fourth of old methods. A quick demonstrating money making sideline for hustlers. Must have auto, and send 25c for pocket selling outfit, which includes sufficient for 8 to 10 cars. Address Common Sense Mfg. Co., 2150 Pine, St. Louis, Mo.

SALESMAN—Side line or full time, calling on banks, offices and factories. Brand new automatic all metal, self-inking dater. Every call a prospect. Thousands being sold. Sample carried in vest pocket. Wonderful opportunity, very liberal commission. Factory 200 Shepherd Ave., Brooklyn, N. Y.

MANUFACTURER Wants salesman to sell double tread tires, reliners, skived patches, blowout boots, tube repair kits, etc., to vulcanizers, garages, tire, accessory, hardware and general stores, on liberal commission basis. Economy Rubber Products Company, 420 Master Ave., Dayton, Ohio.

MAKE Big money—Sell our nationally known all woool tailored to individual measure suits $23.50-$29.50. Commissions $4.00-$5.00. Your big opportunity! Large sample outfit freee! Write General Tailoring Co., Dept. 6, 529 S. Franklin, Chicago.

NEW! Fast seller! Make $3.00 an hour daily. Sell "Advertising Work Suits." Every workman, business a prospect. High-grade low-priced Coveralls, Shop-coats, 2-piece Overalls. Firm name and advertisement woven on back. Outfit free. John Leeding Co., Dept. 396, 70 E. 18th, Chicago.

$18 TO $25 Daily: Biggest selling line of 2-piece suits $9.95 and $12.50; 3-piece wool suit, $17.95 (regular $28.00 value). All-wool overcoats, $18.50. Splendid raincoats, slickers and boys' suits. Biggest commissions. Free outfits. "Jim" Foster, Inc., Dept. 26, 2250 S. Spaulding Ave., Chicago, Ill.

SALESMEN—All or part time in small towns and country districts selling our well-known bath room equipment. No plumbing required, ready for instant use. No competition, easy to sell, big commission. Only 1 sale a week would pay you well. Investment unnecessary. Reply Dept. 60. Roberts Metallic Bath Co., 736 Meldrum Ave., Detroit, Mich.

EXPERIENCED Salesmen—Attractive enamelware propositions—classy colors—easy sellers to hardware, furniture, drug, variety, general stores. Prices below average. Quality and commissions above average. Iron City Tin & Enamel Ware Co., Box 706, Pittsburgh, Pa.

SALESMEN—125 Varieties brushes, 60% commission, $25.00-$100.00 weekly profit on agents. Neway Brush Factory, Hartford, Conn.

EVERY Woman buys "Marvtex" because it doubles wear and prevents runs in silk hosiery. Guaranteed. Big repeater. Agents making big money. Write now or send 50 cents for big package and be convinced. Marvtex Manufacturing Co., 1727 West Morris St., Indianapolis, Ind.

$20 DAILY Easy! New sensational seller, tire armor, doubles mileage, discarded tires give 20,000 miles; outfit free; pay daily. Motor Products, 1758 Lunt, Chicago.

NO Canvassing from house-to-house—Make $10 daily, full or spare time, acting as our district sales manager. A dignified, respectable, good paying position open to honest, reliable men and women. Write for details. No obligation. Badger Co., Ft. Atkinson, Wis.

COMMISSION In advance—Selling auto seat covers, we deliver and collect; experience not necessary. Write today for samples and proposition. Horne Motor Co., Magnolia, N. C.

WONDERFUL Invention seals fifty envelopes minute. Sells on sight at $3.50. Exclusive territory. Kendall Sealer Co., Dept. H20, 210 South St., Boston, Mass.

MR. BRUSH Salesmen—Old Established New York brush manufacturers require services of men in all territories to sell their extensive line of Sanitary Twisted in Wire Brushes. We pay larger commission than any other brush house in the country. Write immediately for proposition. Wire Grip Sanitary Brush Corporation, 41-51 East 11th St., New York.

HOUSEHOLD Mops, self-locking, collapsible frames; yarn sewed on cotton backings; lie flat, covering large surface; no wires, washable. Also car mops; nothing like them; all patented. Write W. O. D. Mop Company, 672 South 17th St., Newark, N. J.

TOOL Salesmen and mechanics with some sales ability sell our line electrical tools to auto mechanics and garages. Easy sales, and very liberal commissions. Barker Specialty Co., Girard, Pa.

MAKE $15.00 A day selling original patented Phone Memo Recorder. Sells itself. No competition. Golden opportunity. Write for territories. Rudley Mfg. Co., 52 S. 60th St., Philadelphia, Pa.

SALESMEN Wanted to sell business printing, highest quality, big commissions, lowest prices. Instruction and outfit free. U. S. Stationery Co., Greenfield, Ind.

ATTENTION: Specialty and clothing salesmen. Fastest selling line today. One suit or top coat $15, commission $3.50. Two for $28.50, commission $6 plus bonus. Union Tailoring Company, Denver, Colo.

PUNCHBOARD Salesmen. $150 weekly, selling new double profit deals from catalog. 100% prospects. 90% sales. Exclusive territory. Repeat commissions. Rudy Sales, 1652 Division, Chicago.

BIG Season just ahead. Advertising pencils most popular every day—every business prospect. Our line repeats. Big commissions. Established in 1902. North American Pencil Works, 126 So. Clinton, Dept. 55-M, Chicago.

MEN—Sell dependable shrubbery, fruit trees, etc. Steady demand. Complete cooperation. Commissions paid weekly. We deliver and collect. Write Perry Nurseries, Dept. R-6, Rochester, N. Y.

A PAYING Position open to representatives of character. Take orders shoes-hosiery direct to wearer. Good income. Permanent. Write now for free book "Getting Ahead." Tanners Shoe Mfg. Co., 356 So. C St., Boston, Mass.

EASY To sell complete line of groceries, paints and auto oils from samples to consumers. Steady profitable work; no capital or experience necessary. Commission advanced. Liberal credit. Loverin & Browne, Wholesale Grocers, E 1500 So. State, Chicago.

BIG Pay every day! Complete guaranteed line direct to wearer—dress shirts, work shirts, overalls, coveralls, work pants, sweaters, underwear, playsuits. $10-$15 daily; experience unnecessary. Big outfit free! Nimrod Co., Dept. 65, 4922-28 Lincoln Ave., Chicago.

$4.00 PROFIT On $5.00 sales—"Free Sample"—New specialty. Money getter. Every storekeeper, doctor buys quickly. Experience unnecessary. Territories open. Box 596, Hartford, Conn.

EARN $20 A day. Establish income for life selling for $1 a year, $1,500 accident insurance policy. Write W. C. Stone, 11 So. LaSalle, Chicago.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

40% COMMISSION Selling printed business stationery at knockout prices. Part or full time. Free outfit. L Process Service, Minneapolis, Minn.

WERE You Ever Offered a Grocery Store? Our proposition is better. Let us tell you how you can handle groceries, auto oil, tires and paint. No rent, no investment in goods. Big pay. Write. Just say, "Show me." Hitchcock Hill Co., Wholesale Grocers, 38 Kinzie, Dept. 50, Chicago.

SALESMEN To sell interchangeable socket wrenches. Good commission. Howerd, 2417 N. Ashland Ave., Chicago.

JUST One Changeable Letter Electric window display with moving colors and light—The Luminate. Our boys get the big money. Don't risk patent infringements—sell the original. 1928 refinements and added features make todays' Luminate irresistible. A weather-proof number for outdoor use. Join the Luminate money-makers. Display Products Company, Ltd., 405-9A, East 31st St., Kansas City, Mo.

SALESMEN—Become Independent. Own your business; experience unnecessary, selling our $7,500 Accidental Death; $50 Accident; $25 Sick Weekly Benefits—$10.00 yearly. Other amounts proportionate. Guaranteed steady income from renewals. $250,000 deposited Insurance Department, Universal Policy, Dept. A, 40 Clinton Street, Newark, N. J.

YOU Can make big money introducing new changeable letter signs. Every merchant buys. Fast sales; big profits. Write for exclusive territory now. Changeable Sign Co., Department M, Redlands, Calif.

TOOL Salesmen—Sell to auto mechanics, guaranteed line of 120 Oldforge tools—wrenches, pliers, chisels, screw drivers, punches, tool boxes. Exclusive territory. Give complete information about yourself, first letter. Quality Tools Corporation, New Wilmington, Pa.

SALESMEN—Cemetery, Memorial Park, Mausoleum. Experienced and inexperienced. Urgent need of men. You can earn more. Free information. J. Joerg, 326 Mt. Vernon, Grand Rapids, Mich.

ALL-YEAR-ROUND Profitable business selling wonderful new water softener and cleaner. Removes grease, oil, ink and dirt quickly. Every home and business place a live prospect. 100% profit. Big repeat orders. Exclusive territory. Write for free sample. Seacoast Laboratories, Sea Bright, N. J.

SALESMEN—Semi-Liquid rubber repairs punctures and blowouts without heat or tools. Everyone buys. Salesmen coining money. Get territory quick. Marquette Co., 2325A Wolfram, Chicago.

GOLD-LEAF Window letters and script signs. No experience; 500% profit. Samples free. Meyer writes 5 days profits $141.36. Consolidated, 69-V, West Van Buren, Chicago.

SALESMEN—Four $15.00 sales to merchants net you $40.00 daily. Sayers Systems, 2813 Sheffield, Chicago, Ill.

ANY Salesmen Can Sell Them! Merchants everywhere use punchboards. Someone sells them, why not you? Collect big commissions daily. Newest, largest, elaborate catalog sent upon request. Lincoln Sales Co., 9 So. Clinton, Chicago, Dept. D.

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-A North Clark, Chicago.

SEND name, address on postcard. Free introductory copy Modern Salesology Magazine; 1000 money-making opportunities offered by big reliable firms; no obligation. Salesology Magazine, Desk B-39, 500 No. Dearborn, Chicago.

PUNCHBOARD Salesmen. 2 hours daily, $100 every week. New line. Lowest prices. Full commission on repeat business. Catalog free. Puritan Novelty Co., 1409 Jackson, Chicago.

TO Market 3A garage door holders, simple automatic action, quickly installed, instantly attracts garage owners, builders, dealers. Write for exclusive territory proposition. Knowlson-Stevenson Co., 1118 Packard, Ann Arbor, Mich.

WONDERFUL Free Selling Outfit with actual samples of Bostonian Broadcloth makes quick sales for our Nationally Known Bostonian Shirts at 3 for $6.95, Postage Paid; $9.00 value; guaranteed fast colors. Liberal cash commission of $1.50 on each order of 3 shirts means Big Money for you. Bostonian Mfg. Co., Dept. M. 2., Boston, Mass.

PUNCHBOARD Salesmen—making small towns. One sale a day nets you $105 weekly. Full commission on repeats. K&S Sales Co., 4395 Ravenswood Ave., Chicago.

HELP WANTED

GET Any job you want quickly—send dollar bill for book "Making Most of Your Personality and Ability" and "Three Ways to Sell Your Experience and Services." Get $40, $50, $60 a week and up, now. The Open Door, Box 179, South Norwalk, Conn.

SALARIED Positions $2,500 to $25,000. If you are open to overtures for new connection, and qualified for a salary between $2,500 and $25,000, your response to this announcement is invited. The undersigned provides a thoroughly organized service, of recognized standing and reputation, through which preliminaries are negotiated confidentially for positions of the caliber indicated. The procedure is individualized to each client's personal requirements; your identity covered and present position protected. Established seventeen years. Send only name and address for details. R. W. Bixby, Inc., 301 Downtown Building, Buffalo, N. Y.

SALESMEN: Manufacturer and distributor of one of country's leading lines automotive hand tools and equipment has exclusive territory open. Proposition assures good income to right man on commission basis. Applicant must own car. Write for proposition to Woods Organization, Inc., 37 W. 20th St., New York, N. Y.

YOU Are wanted to resilver mirrors at home. Immense profits plating autoparts, tableware, etc. Write for information. Sprinkle, Plater, 287, Marion, Ind.

$14.85 DAILY In advance (spare time will do) introducing 12 months insured hosiery. All styles and colors, for men, women, children. "Silk to Top" ladies'; misses' "Sport"; men's "Fancies." Capital, experience unnecessary. We furnish samples. Silk hose for own use free. New plan. Milton Mathews, Park 2606, Cincinnati, Ohio.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 32.

OBTAIN Employment! Get positions you want, quickly, anywhere. Use clever "Ways That Win." One person was offered 70 jobs! Complete methods, 50 cents. Money promptly returned if wanted. New Idea Service, Box 39-1, Station K, New York.

IMMENSE Profits making French plate mirrors; patented process; easily learned. Plans free. Wear, Excelsior Springs, Mo.

SEND name, address on postcard. Free introductory copy Modern Salesology Magazine; 1000 money-making opportunities offered by big reliable firms; no obligation. Salesology Magazine, Desk B-40, 500 No. Dearborn, Chicago.

BECOME A Landscape Architect. Uncrowded profession; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1916. Write for details. American Landscape School, 56, Newark, N. Y.

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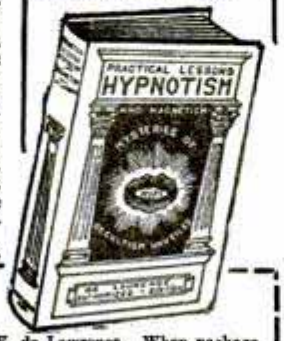

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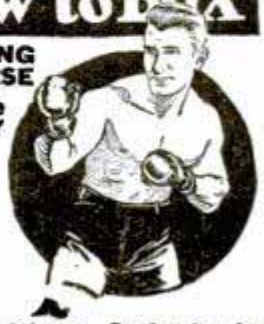

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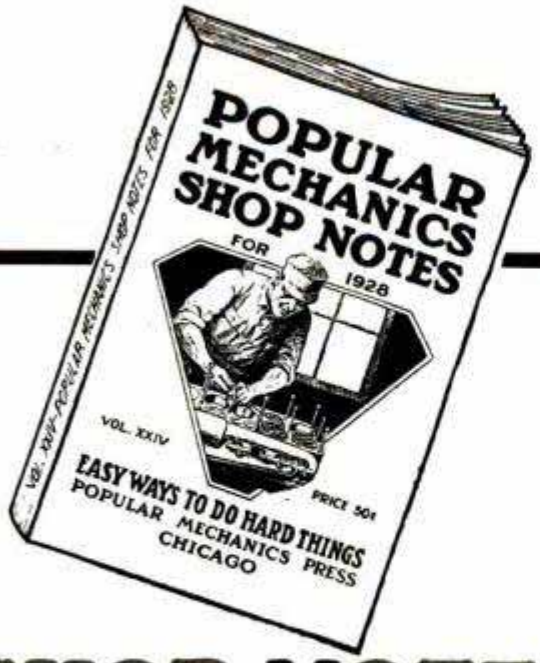

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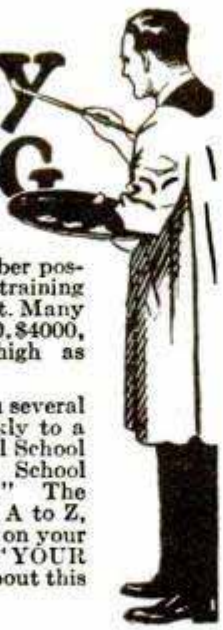

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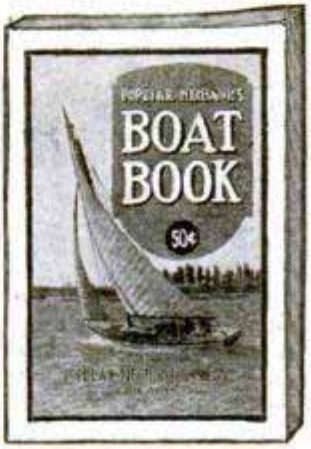

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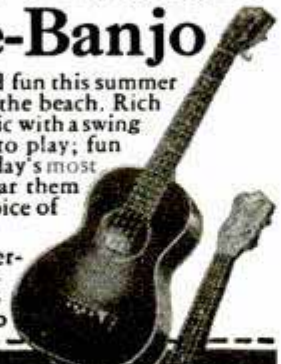

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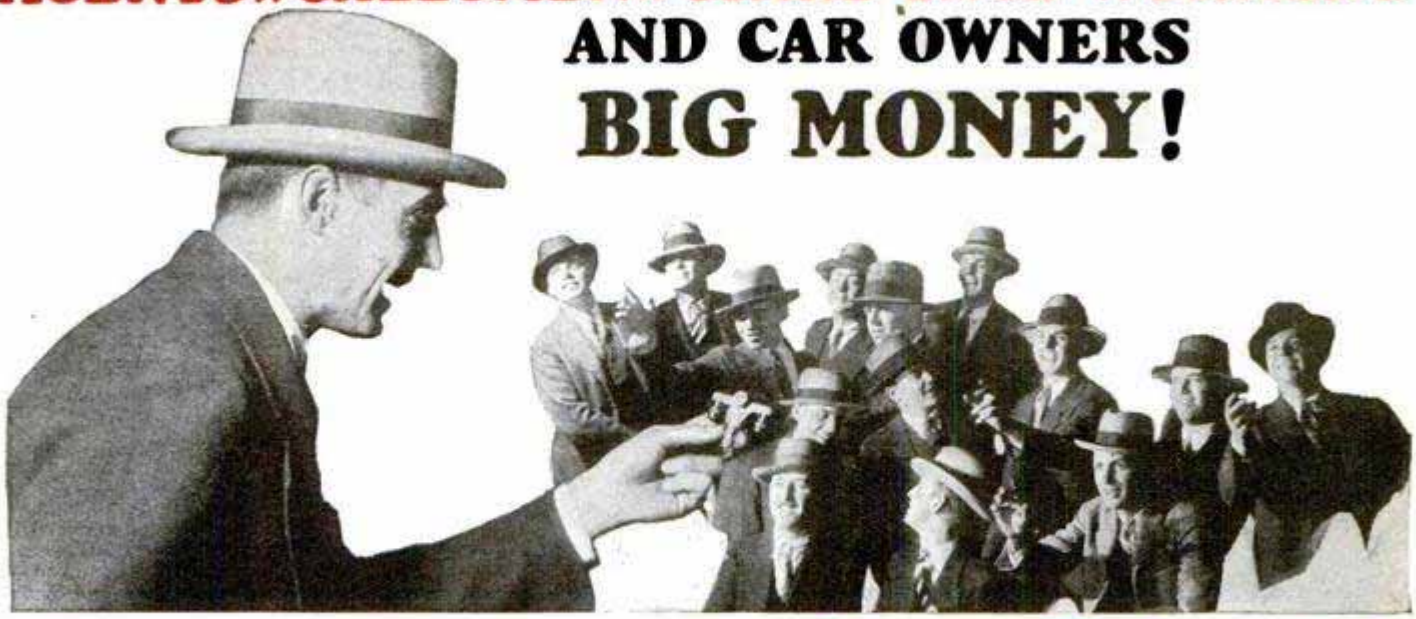

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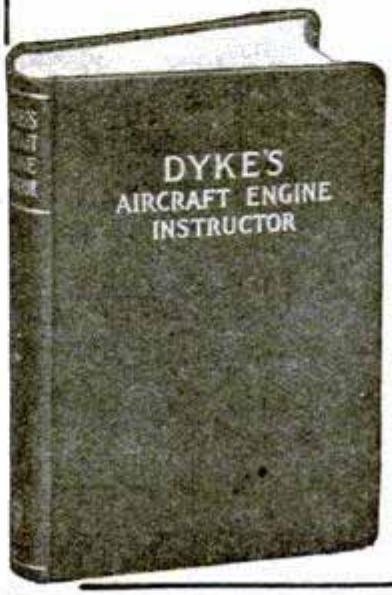

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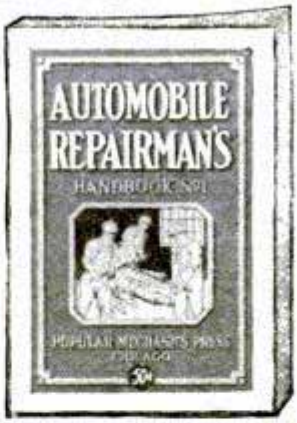

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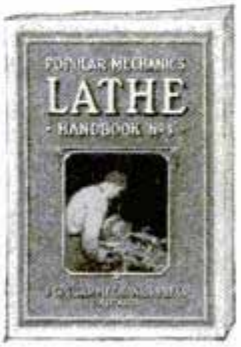

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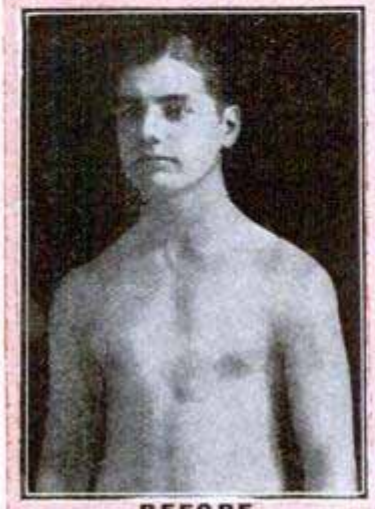

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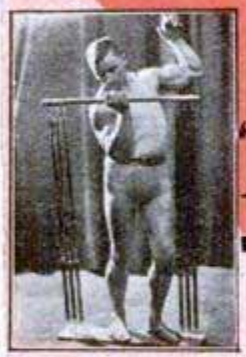

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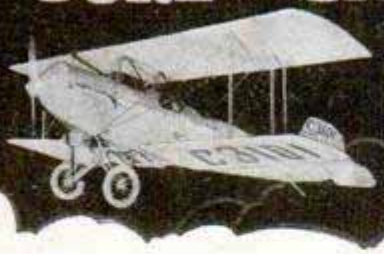

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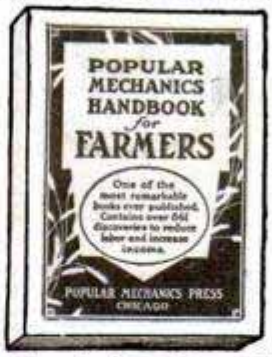

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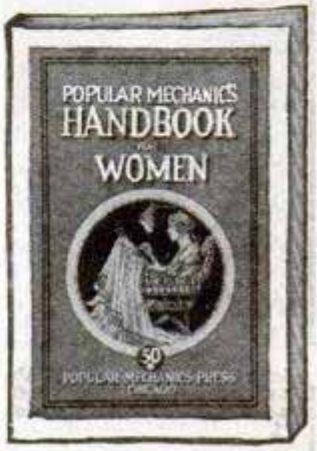

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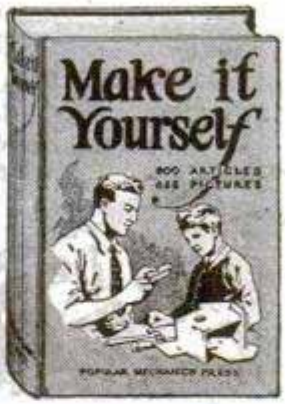

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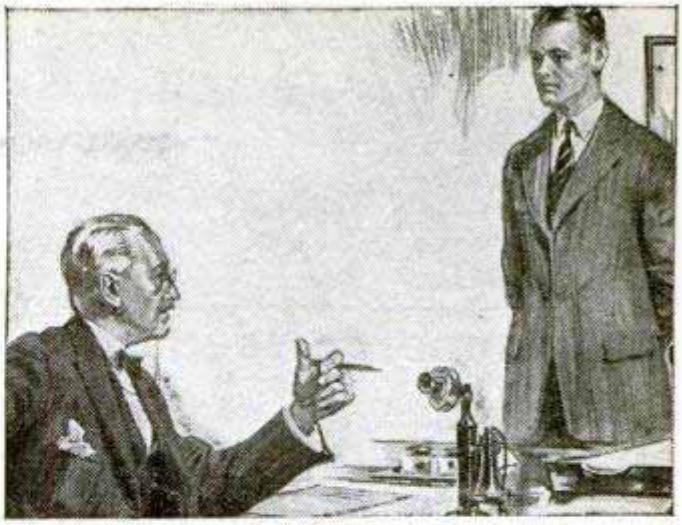

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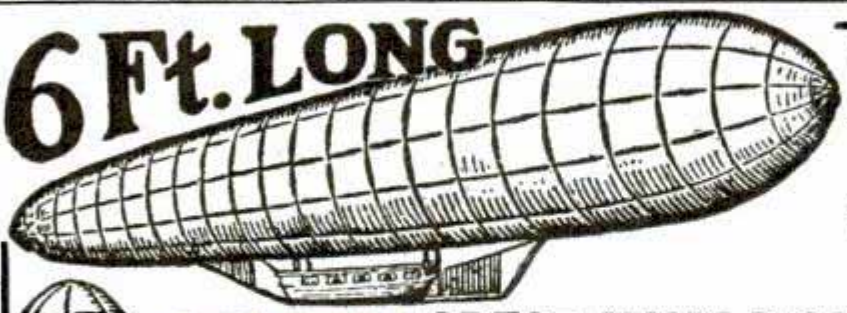

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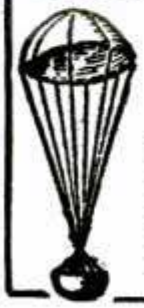

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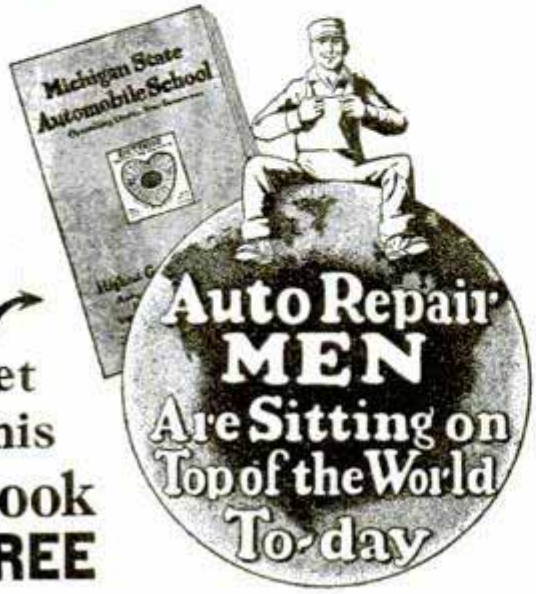

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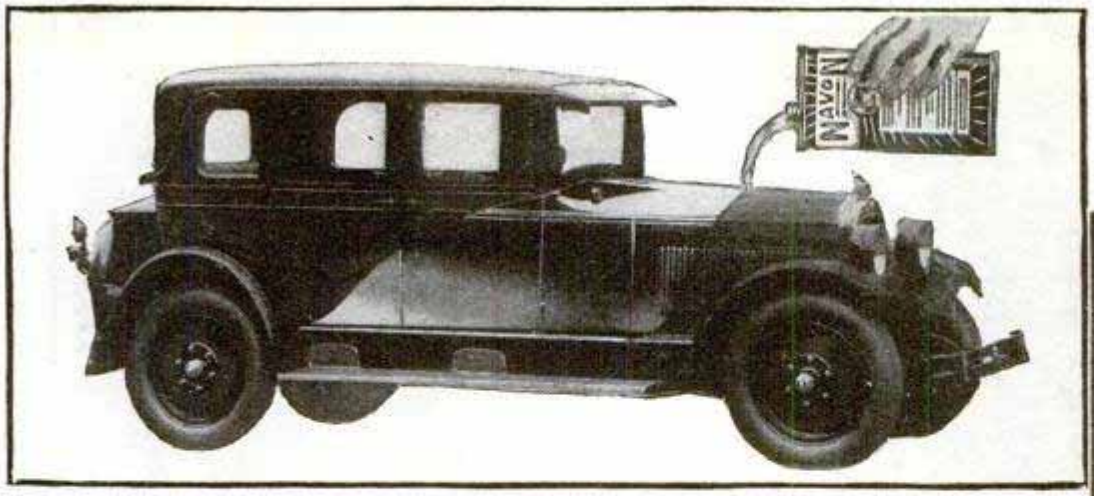

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IMAGINE being able to restore your old car to original showroom lustre in less than an hour! Imagine being able to bring back all the beauty of its original color by a few sweeps of the hand across its surface! No wonder experts say that NAVON is the most surprising auto discovery in the past ten years!

NAVON has often been called "liquid magic" because of the speed with which it draws forth original color and makes dull surfaces gleam like burnished glass! It is not a polish—not a wax—not a paint—not a cleaner! You just put it on the car right out of the can, guiding its flow with a pad of cheese-cloth. No fussing with brushes or tiresome rubbing. (It's more like pleasure than work, especially when you see your car regaining its original rich beauty and gloss right before your very eyes!)

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Results with NAVON are easy to secure. You can do it right in your own garage without the slightest difficulty. It's almost as easy as washing—dries smooth as glass without streaks. Even a 14 year old boy who follows the printed directions can achieve a flawless finish with NAVON!

And not only that, NAVON contains no acids, alcohol, benzol or any other injurious substance. Won't hurt metal, leather or wood. Acts both as a protective and preservative. Not affected by zero cold, freezing snowstorms, burning sun or driving rain. Can't check, crack or peel. And retains its radiant gloss for months and months!

TEST IT FREE OF RISK!

Right now—to gain new friends for NAVON—we are making a special trial offer to auto owners. This generous proposition gives you a chance to test this marvelous discovery and see for yourself just exactly what wonders it can perform. It doesn't cost you a red cent unless it improves the looks of your car 100% to your satisfaction. So take advantage of the opportunity by getting details at once. No obligation. Simply tear out the handy coupon below and mail it today! Why not do it now?

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Make big money with NAVON! Agents, demonstrators and spare time workers are pocketing surprising profits. 9 out of every 10 motorists want it on sight! H. Geiss of Illinois made $500 in a single week! Others are making big money just showing NAVON to friends, neighbors, etc.

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Send for details of our 14 Tested Money-Making plans—together with a NAVON trial offer that will amaze you! Check bottom line of coupon and mail it today!

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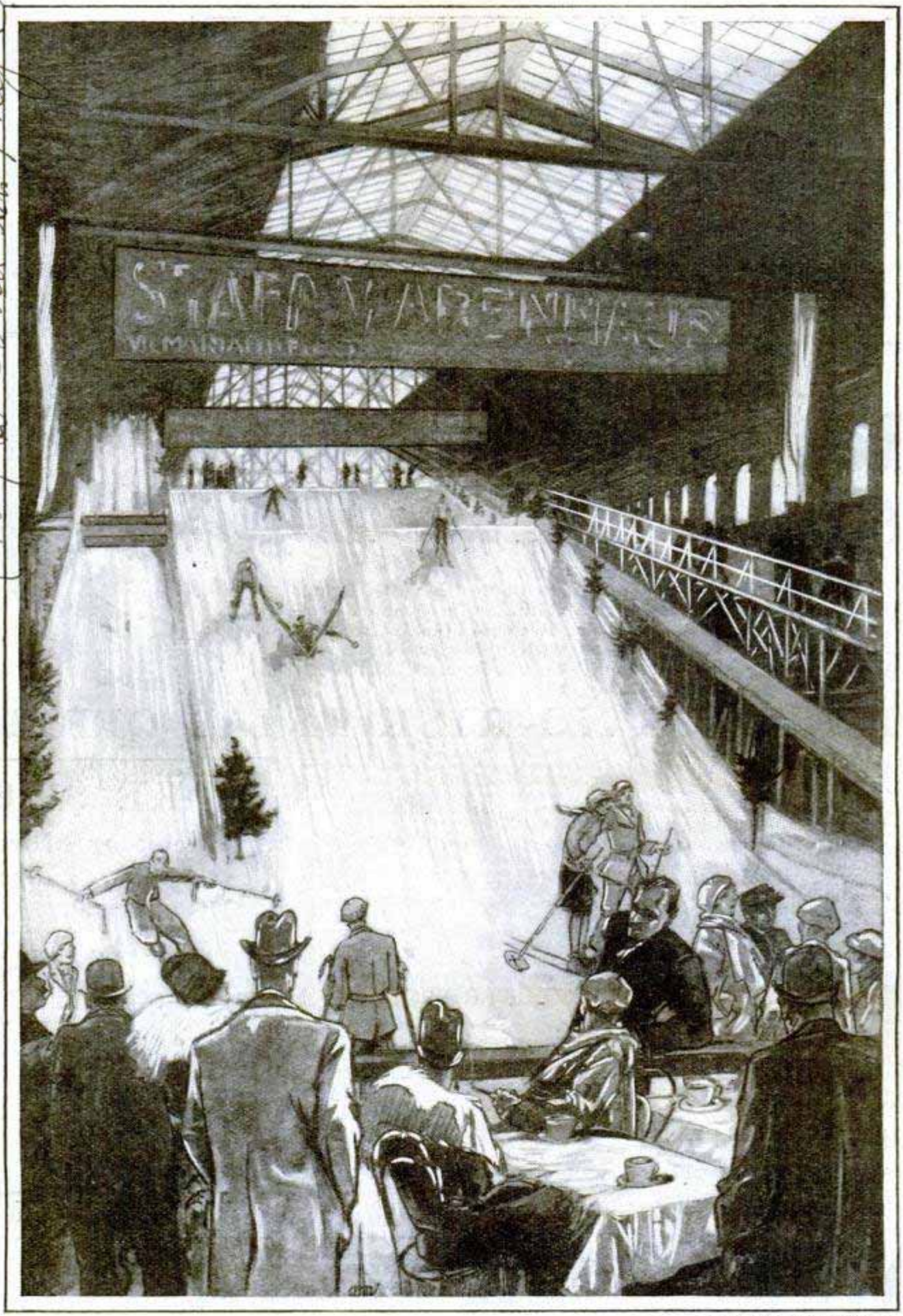

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Viennese Are Able to Enjoy Skiing and Ski Jumping the Year Around Since the Main Hall of a Former Railroad Terminal Has Been Converted into a Winter Sports Field, with Artificial Snow, the Invention of an Englishman, on the Slides; Similar Year-Around Snow Slides Are Being, or Have Been, Installed in Berlin, Dresden and a Number of Other German Cities

L. C. Upcough

Popular Mechanics Magazine

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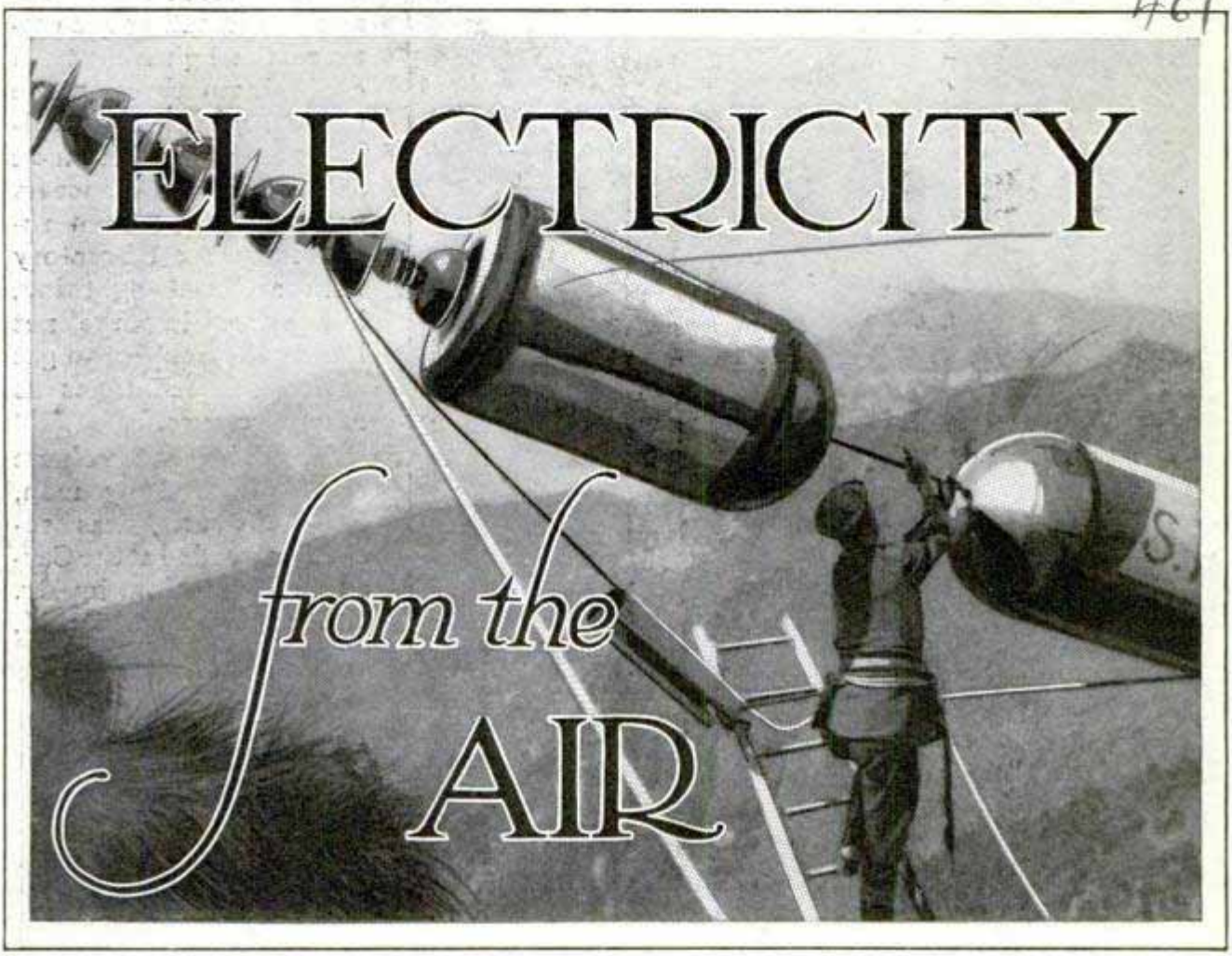
Vol. 49 JUNE, 1928 No. 6



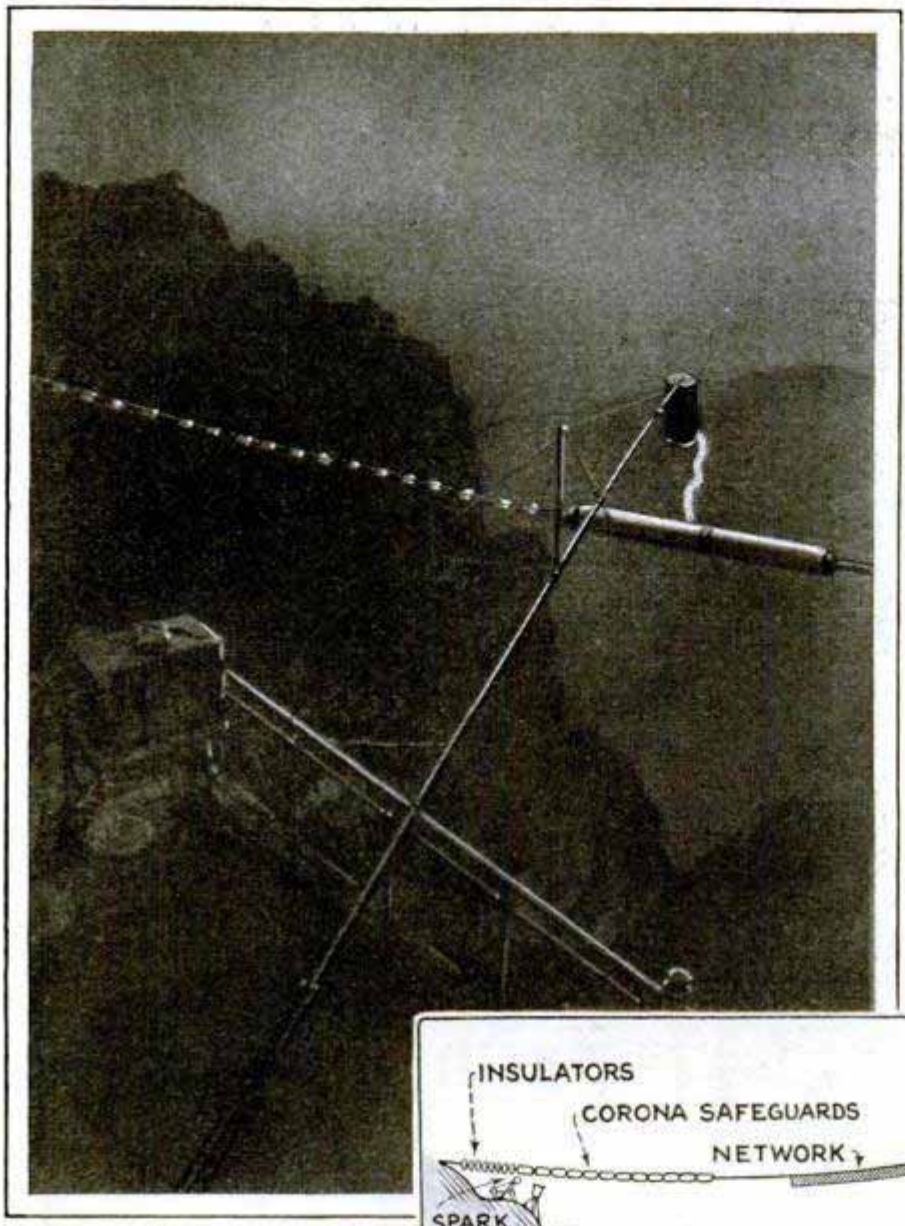
Italian Workman, Suspended in Mid-Air, Installing the Generoso Antenna Plant Where Lightning Is Collected on Long Cable; 30,000,000 Volts from a Single Flash May Be Gathered

THE old dream of harnessing the lightning and putting it to useful work may be on the way to realization, as the result of experiments by three scientists of the University of Berlin, who have taken up the task where Benjamin Franklin left off more than a century and a half ago.

On lofty Mount Generoso, in Switzerland, they have plucked nearly 2,000,000 volts out of the storm clouds and sent it crashing over a spark gap fifteen feet in length.

During the coming summer, when storms are frequent over the Swiss mountain, they expect, with new and better collecting apparatus, to gather in 30,000,000 volts in each discharge. They have already found they can collect enough static to produce a spark a second. With 30,000,000 volts to work with, they will be able to produce extremely rapid cathode rays, similar to those generated in the new Coolidge tube, and rivaling the principal rays of radium, except that the rate of emanation will be far faster than from radium itself.

The three experimenters, Drs. A. Brasch, F. Lange and C. Urban, improved on Franklin's original kite experiment, which established for the first time the nature of lightning, by suspending their collecting antenna from a cable stretched between two mountain peaks. They used a wide-meshed wire net with an area of several



Spark Passing across Gap in the Small Preliminary Plant during a Thunderstorm, and Diagram of the Antenna Installation; Note the Collecting Net in the Center

hundred square yards and a weight too great to be supported in a storm by either kites or balloons. To suspend it a cable was stretched over an 1,800-foot chasm, with the net swung 250 feet above the ground, protected at either end by long chains of huge insulators, capable of checking up to 3,000,000 volts of electricity.

To prevent so-called "brush discharges," or corona effect in the conductors leading from the net to the spark gap, cylinders were substituted for solid wire, as the carrying capacity of a conductor depends on its surface area, and a large cylinder is a better conductor than a solid wire containing the same amount of metal.

Observations and measurements were made from a lightning-proof metal house, grounded to prevent danger to the experimenters. From it they controlled the spark gap, which recorded the voltage by indicating the distance the lightning flash could jump through the air. In the initial experiments they did not achieve as much success as has already been recorded in the laboratory with artificial lightning, but by raising the net higher they expect to get at least fifteen times as much pressure.

The highest voltage ever produced by man, 5,000,000 volts, was recently recorded at the Carnegie Institution, by Dr. Gregory Breit and Dr. M. A. Tuve. They succeeded in impressing a million volts on a vacuum tube with outside electrodes.

The Carnegie scientists are aiming at the same goal as the Germans, 30,000,000 volts, at which potential many of the moot questions of physics may be settled. Theoretically, it may be impossible to have radiation at this high voltage, since the electron would be damped and all wavelengths would become one. If 30,000,000 volts can be produced and handled it would make possible the production of helium atoms, each one from four atoms of hydrogen. Such conversion of matter might solve the lighter-than-air flying-craft problem.

MOVIES SENT BY PHONE TO SPEED UP NEWS REELS

Filming a Movie Star in Chicago; the Picture Transmitted, and Sending Apparatus

Transmitting news reels of current events from coast to coast on the day they are taken is a practical possibility, it was demonstrated recently when a movie of a film star, made in Chicago as she stepped off a west-bound train shortly before noon, was telephoned to New York in time to be shown in a theater there in the early evening. The first telephoned movie was not perfect, the enormous enlargement on the theater screen being rather hazy, but it proved that, with further development, the process may be a success. Transmission of the movie film used the same apparatus and methods which have been in service for the last three years for telephonic transmission of ordinary "still" photographs. The telephoto machine takes five by seven-inch pictures, so the negative from the movie camera was cut into seven-inch lengths, and three strips at a time were laid down side by side in a frame and placed in the photo printer, to produce the positive film required for its transmission by telephone. At New York, the process was reversed to produce a movie film. Five hours after the operation of taking the pictures had begun in Chicago, enough film had been transmitted to make ten feet of movies.

Vilma Banky

American Telephone & Telegraph Co.

At Entrance to Old Railway Tunnel Now Used by Automobiles; the Clock and Sign Help Regulate One-Way Traffic

ONE-WAY TUNNEL FOR AUTOS ALSO AIDS IRRIGATING

Although it is now abandoned for railroad purposes, an old tunnel of the Colorado Midland railway serves a double purpose, for it is used by automobiles and also as an irrigating flume to water more than 20,000 acres of land. The passage is but one stretch of the old railroad line which has been adapted for highway uses after the engines and cars were taken off, due to the discontinuance of the railroad. It is two miles long and has a four-per-cent grade. Because it is so straight, no artificial ventilation is necessary, but automobiles must be run through on a carefully regulated schedule, since the tunnel is wide enough for only one car at a time. Clocks at either end and signs aid the motorists. At one portal, the directions are to enter only between the half hour and ten minutes to the hour, while, at the other, cars may commence the journey between the hour and ten minutes to the half hour. The tunnel is at an elevation of more than 10,000 feet and saves a rough trip, over steep hills, into the Eleven Mile canyon, one of the state's minor gorges.

VOICE AND PICTURE CABINET GIVES LECTURES

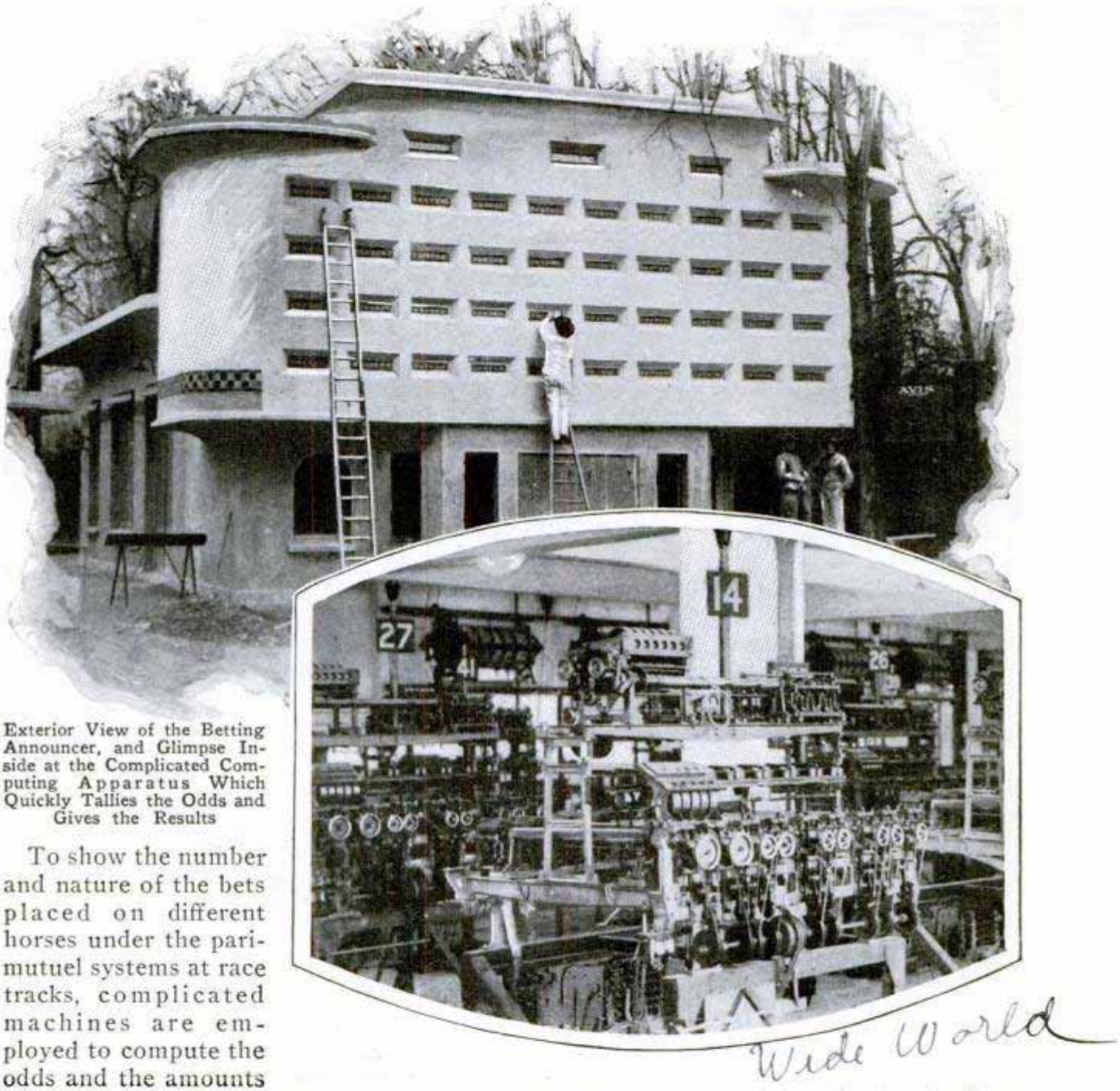
Illustrated lectures, without a human speaker, are given by a combination stereopticon and phonograph an eastern inventor has introduced. The records are synchronized with the showing of the slides, and all an attendant has to do is to change the records and a set of slides at the proper time. The entire outfit is mounted within a compact cabinet.

PHONE SET FREES BOTH HANDS AND INSURES PRIVACY

By attaching a special mouthpiece and a holder for the receiver, an ordinary telephone instrument is quickly converted into the "mono" type familiar abroad. The arrangement leaves both hands free and the mouthpiece is so shaped as to permit clear conversation with less likelihood of being overheard by others near by. Both attachments can be put on and taken off quickly.

Using the Telephone without the Hands; the Mouthpiece and Receiver Attachment in Service

GREAT MACHINE RULES BETTING AT FRENCH RACES



Exterior View of the Betting Announcer, and Glimpse Inside at the Complicated Computing Apparatus Which Quickly Tallies the Odds and Gives the Results

Wide World

To show the number and nature of the bets placed on different horses under the pari-mutuel systems at race tracks, complicated machines are employed to compute the odds and the amounts each horse will pay. One of the most elaborate units of this kind has just been finished for the Longchamps course near Paris. It is housed in a building of distinctive architecture, the figures being shown in a series of slots.

LIFE OF RACING AUTO TIRES LESS THAN FOUR MINUTES

One of the most important factors in the success of a racing automobile is the tires. When Major Segrave was assembling the car in which he attained a speed of more than 207 miles an hour at Daytona beach, a record later broken by Capt. Malcolm Campbell, he consulted an expert as to the best tires for his racer. After a series of elaborate tests, the man replied: "We have built tires for you and I can safely guarantee you three and one-half minutes' life at 200 miles an hour for each tire." They stood the trial as did other parts of the racing car but the guarantee period, an amazingly short time compared with the life of the average automobile tire, shows how close to the breaking point the "super-racers" are constructed and what terrific strains are exerted upon them.

Illustrated London News 23/10/28

Will He Find the "Lusitania"? Inventor Descending in Diving Bell Which Is Equipped for Taking Movies under the Sea

MOTOR-DRIVEN DIVING BELL FOR DEEP-SEA MOVIES

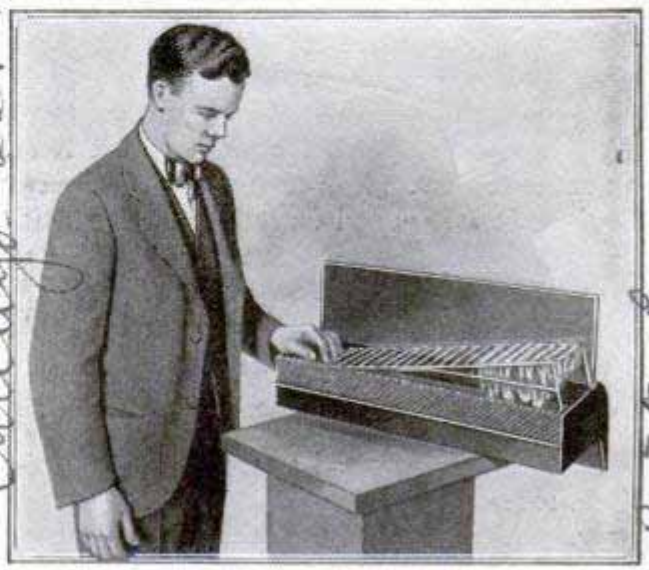
Motion pictures under the sea at depths heretofore impossible are expected with the aid of a motor-driven diving bell recently tested. It is equipped with four powerful searchlights, can carry two persons, weighs nearly 5,000 pounds and is moved by propellers. The inventor hopes to be able to descend in it over the wreck of the "Lusitania" and take pictures.

SIZE OF SUN KEEPS CHANGING MEASUREMENTS SHOW

That our sun is like a big fiery heart that beats at a regular rate, becoming alternately larger and smaller, is the interesting discovery of scientists at the astronomical observatory in Rome. These "beats" occur over periods of eleven years and can be measured only by the most accurate instruments and after painstaking checking. In scientific terms, the discovery means that our sun is a pulsating star. Its diameter becomes larger and then decreases. The variation is of further interest for the reason that it has a direct relation to the occurrence of spots on the surface of the sun. Just before the period of the greatest number of spots, the diameter is greatest, and smallest when spots are few. To discover this, observers, on every sunny day for the last fifty years and more, have been making careful measurements of the sun at noon. Through an astronomical telescope which produced an image of known size, the sun was projected upon a white screen and there measured by means of a network of thin cobwebs. In order to insure close accuracy, the measurements were taken by three scientists, each repeating his operations seven times.

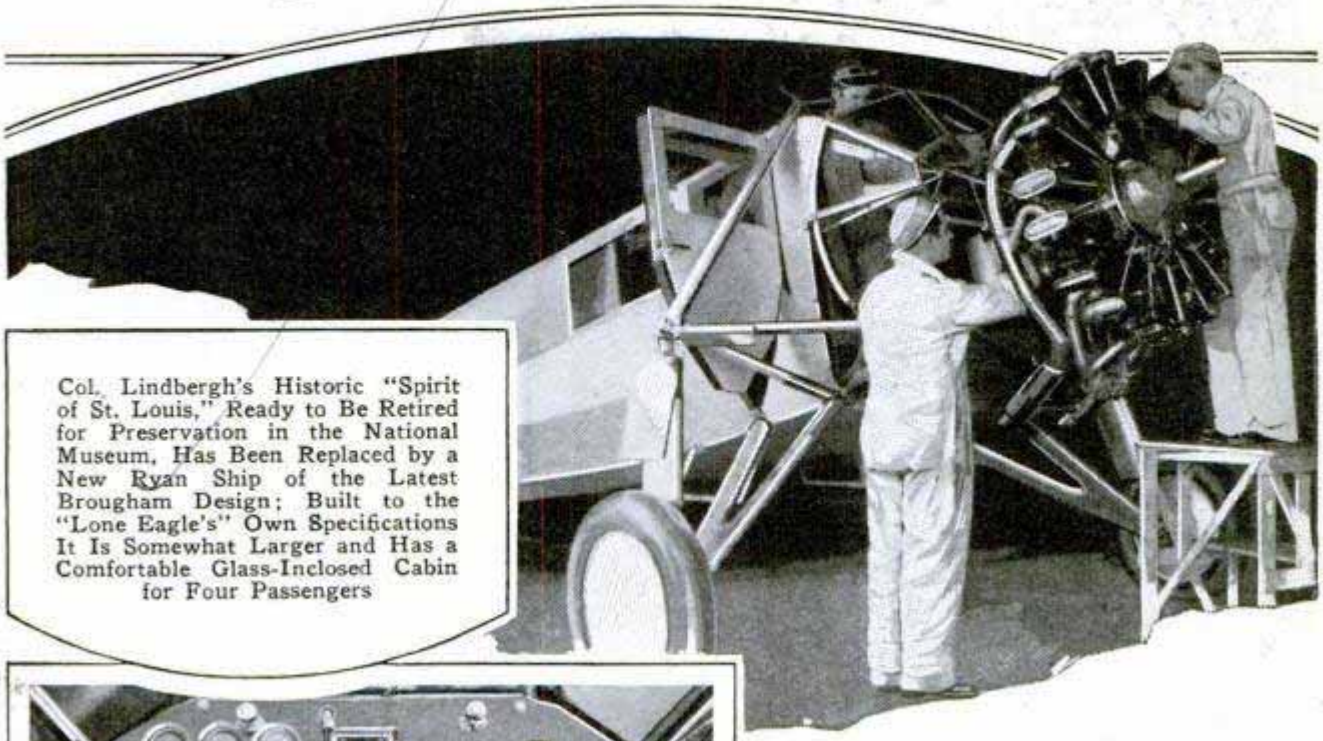
WICKS IN HUMIDIFIER SPEED EVAPORATION

Cloths dipped in water and hung on a rack in a radiator humidifier now on the market, speed evaporation and so insure a better moistening of the air in a room. Heated air from the back of the radiator, is caught by a protruding apron at the back of the container and is drawn through the festoons of the cloth which are hung inside. The increase in evaporation surface is what makes the unit efficient.

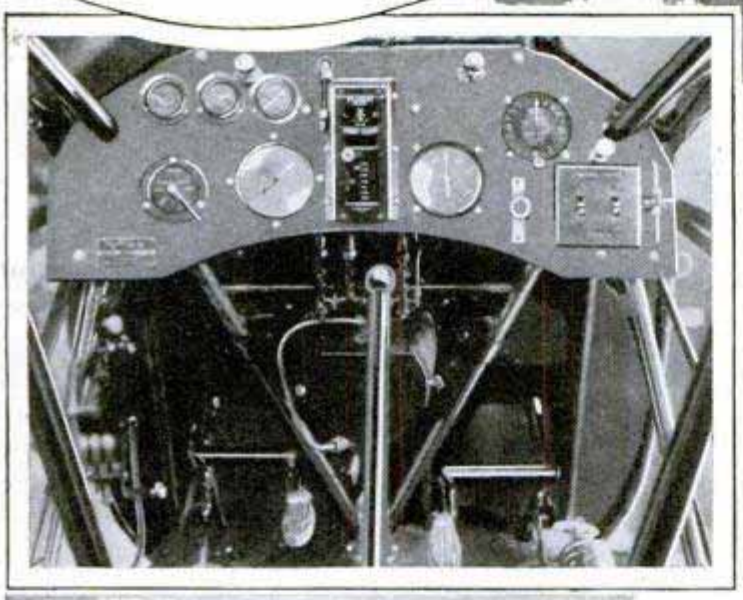


Cloth Wicks in This Radiator Humidifier Absorb Water from Pan and So Increase Evaporation

LINDY'S NEW PLANE WILL CARRY FOUR PASSENGERS



Col. Lindbergh's Historic "Spirit of St. Louis," Ready to Be Retired for Preservation in the National Museum, Has Been Replaced by a New Ryan Ship of the Latest Brougham Design; Built to the "Lone Eagle's" Own Specifications It Is Somewhat Larger and Has a Comfortable Glass-Inclosed Cabin for Four Passengers

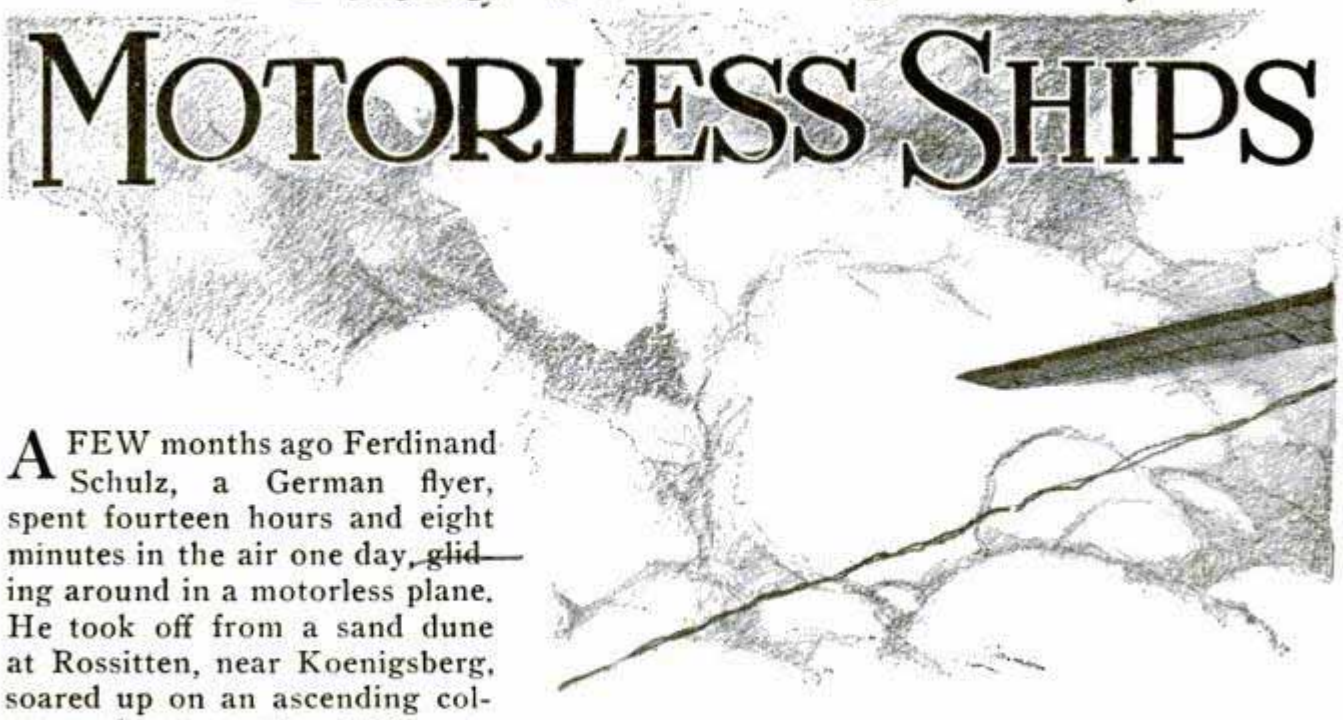


Mechanics Installing the Wright Whirlwind Motor of the New Plane, Above, and, at Left, the Cockpit and Instrument Board; with Pilot and Four Passengers, the Ship Can Climb to 16,000 Feet; the Cockpit Is Comfortably Upholstered in Automobile Style with Silk Mohair; Ten-Inch Landing Lights Are Built into the Leading Edge of the Wing Tips, Special Windows Are Low Down in the Fuselage to Give the Colonel Good Vision Below; the Tail Skid Is Fitted with a Caster Wheel; Landing Brakes, Operated by Pedals on the Rudder Bar, Are Placed on the Wheels, and a Full Set of Special Navigating Instruments Is Provided, as Well as a Release for Landing Flares in Night Flying; the New Ship Has a Top Speed of 126 Miles an Hour, Weighs 3,600 Pounds, and Can Carry a Useful Load of 1,550 Pounds; the 115-Gallon Gas Tank Gives It a Cruising Radius of 1,000 Miles without Refueling; a Thick Lining of Balsam Wool between the Outer Fuselage and the Cabin Upholstering Will Reduce Engine Noise to a Minimum

Lindbergh's New Plane, Showing the Extra Windows in the Cockpit and the Landing Lights Built into the Wing Tips

35 Gossler Strasse 20,
Berlin-Friedenau, Germany

MOTORLESS SHIPS



A FEW months ago Ferdinand Schulz, a German flyer, spent fourteen hours and eight minutes in the air one day, gliding around in a motorless plane. He took off from a sand dune at Rossitten, near Koenigsberg, soared up on an ascending column of warm air, which was climbing above the heavy cold currents off the sea, and continued to soar and glide and dip through the day and into the night.

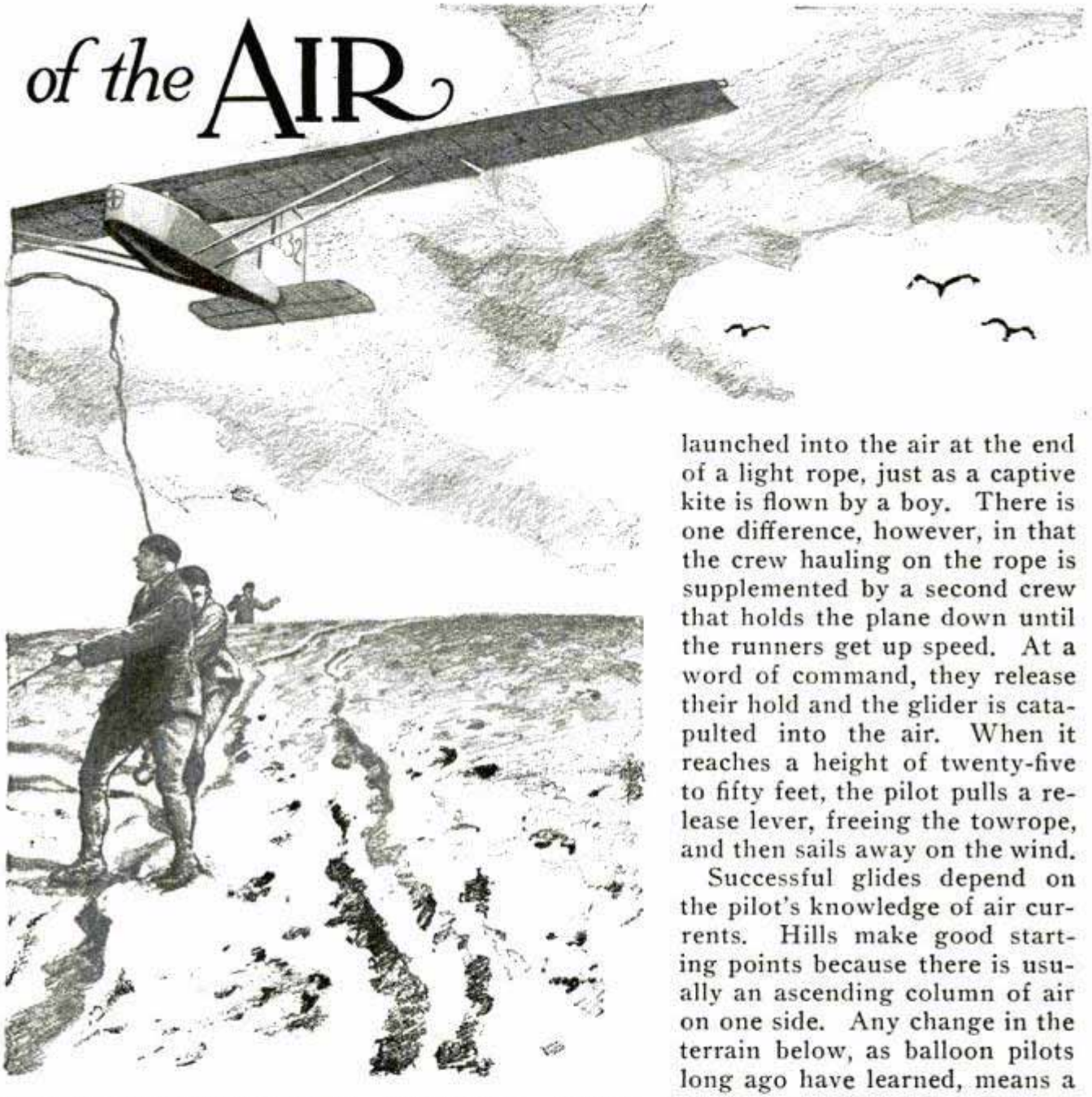
Two days later, at the same place, Pilot Nehring and a friend climbed into the cockpit of a motorless monoplane, a group of friends grabbed the flying rope, took a short run through the sands, and catapulted the ship with its two passengers into the air, where they stayed for five hours and twenty minutes. Schulz, months earlier, had taken a passenger up for nine hours and twenty-one minutes, but the record was disallowed because he not only carried a passenger along, but likewise an engine, though he didn't use the latter. He set another record ten days after Nehring's feat, however, by hopping off at Rossitten and riding a wind current across country for nearly thirty-nine miles before he came to earth.

From the first crude gliders of Otto Lilienthal, the German, Octave Chanute, of Chicago, and the Wright brothers, to the latest German motorless machines, is a far step. The early gliders, frail structures of bamboo and fabric, built sometimes like a giant box kite and again, as in Lilienthal's model, like an enormous glorified bat, would do, as their name implies, just one thing—glide down the wind from some height, and, if the pilot was lucky, land him safely at the bottom.

The latest machines are more than gliders, for they not only glide, but soar, and therein lies the secret of their ability to remain aloft for many hours, make long journeys across country and climb, as Ferdinand Schulz did near Marienburg last October, to a height of more than half a mile. On that occasion he picked a favorable air current, rode it up to a height of 2,566 feet above the earth, and continued to float about up there for more than four hours.

All of the early glider experiments, which led eventually to the perfection of the motor-driven airplane, consisted in straight glides, never exceeding more than

of the AIR

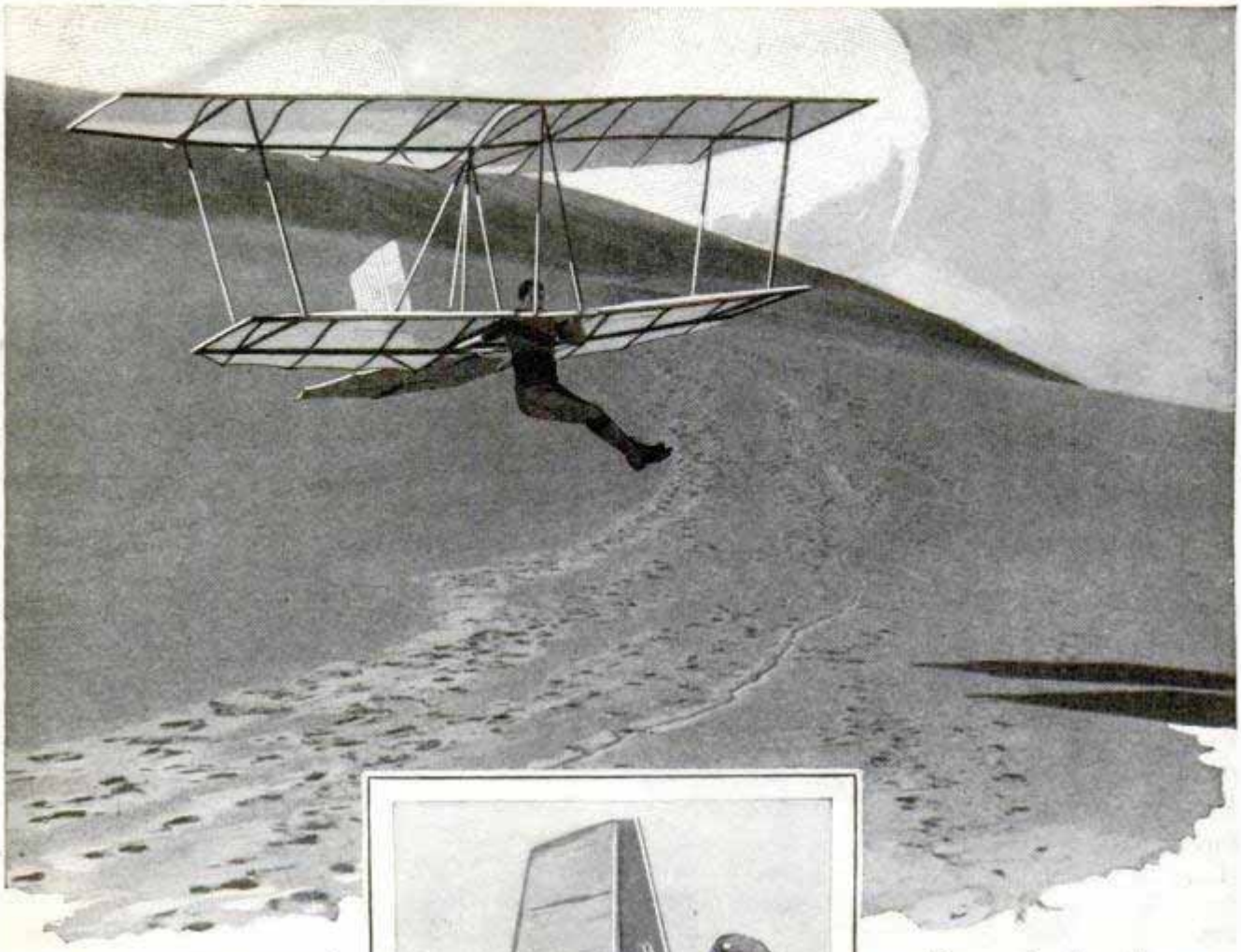


a few hundred feet in length. The glider pilot, taking off with a short run from a hilltop, would rise a few feet in the air at most, and glide to the ground again at the foot of the rise. During the descent, usually made with his body hanging below the framework so that, by throwing his weight from side to side, he could keep his balance, the shifting center of gravity formed the only control, a control so tricky that it ended many flights in disaster, and caused the death of Lilienthal.

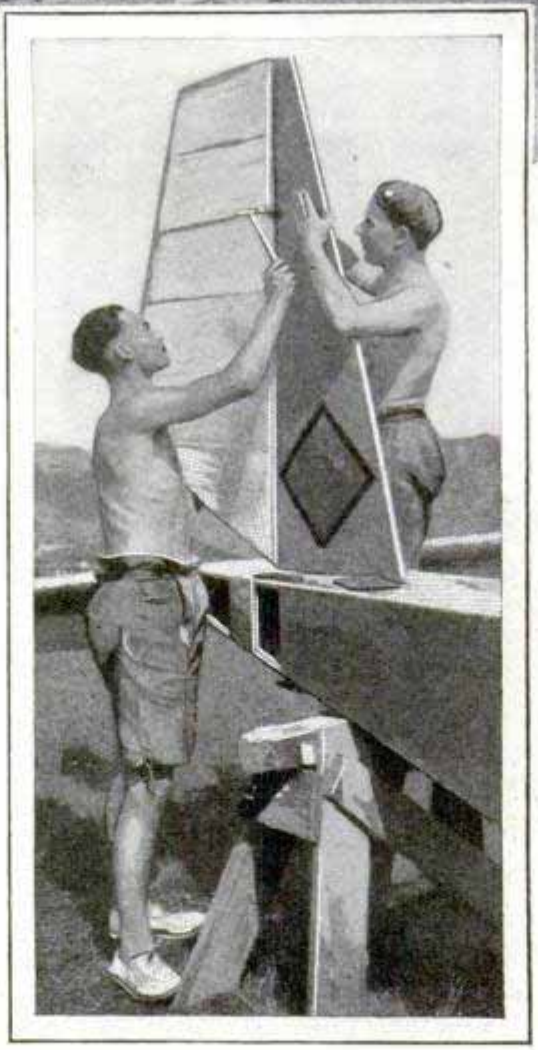
The new motorless airplanes are entirely different. Sitting in a comfortable cockpit, the pilot operates rudder, tail flippers and ailerons through the same sort of controls as in a motor-driven plane. The usual method of taking off is to be launched into the air at the end of a light rope, just as a captive kite is flown by a boy. There is one difference, however, in that the crew hauling on the rope is supplemented by a second crew that holds the plane down until the runners get up speed. At a word of command, they release their hold and the glider is catapulted into the air. When it reaches a height of twenty-five to fifty feet, the pilot pulls a release lever, freeing the towrope, and then sails away on the wind.

Successful glides depend on the pilot's knowledge of air currents. Hills make good starting points because there is usually an ascending column of air on one side. Any change in the terrain below, as balloon pilots long ago have learned, means a change in air currents aloft. Passing from smooth ground to rough, from open country to a forest, or vice versa, from over land to water, all can be utilized by a clever pilot to get more altitude by facing his ship into the rising wind, so that the lift exceeds the normal loss of altitude in a glide. As altitude is attained, the ability to stay up longer grows, for air currents are more pronounced and the wind blows harder, as a rule, at greater heights.

Some of the German students who have been flying for the last six years in their constantly improving models have become so familiar with the air currents that they can pick a destination in advance, and then go to it. Nehring was the first to



make a predetermined flight. He took the air from the Wasserkuppe, flew to Milseburg, and then returned to his starting point. Another German pilot, Kegel, after mastering the science of motorless flight, added a small fourteen-horsepower engine to his machine, to be used only when the wind was not favorable, and succeeded in flying entirely around the Zugspitze mountains in the Bavarian Alps at a total cost for gasoline of about $1. He ascended more than two and a half miles under power, and then utilized the air currents most of the time to make the trip.



German Students Assembling a Glider's Tail, and Dr. Peltzner in an Early-Style Biplane Glider

One of the German pioneers, Espenlaub, introduced a novelty at the Rossitten glider meet last year when he brought out a machine that was towed aloft by a motor-driven plane. When he reached the desired height, he cast off the towrope and proceeded to glide for hours before coming down. So little power is needed to tow one of the well-designed gliders that Espenlaub's machine was taken aloft by a light airplane equipped with only twenty-five horsepower, which puts it in the class of the smallest light airplanes built in the United States. Forty horsepower is

considered a small "flivver" plane, but with fifteen horsepower less, the German pilot succeeds in flying not one plane, but two —the motor ship and its trailer.

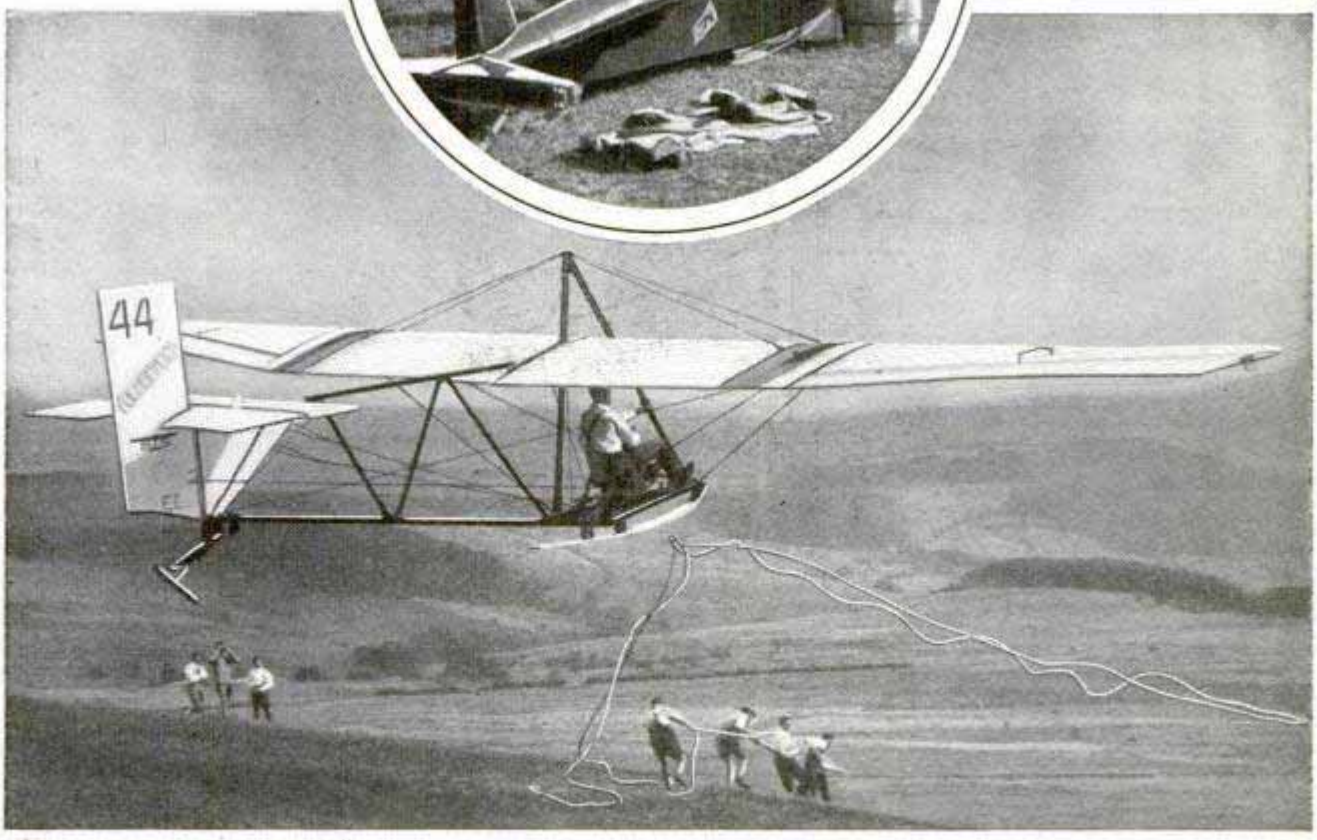
Most of the German gliders have been built by engineering students of the various universities, who have organized glider-flying clubs, just as is now being done by several American colleges which have aviation schools. A glider can be built for from $75 to $200, the expense depending on the degree of finish and equipment desired.

The visit of the German pilots with the pick of their machines this year for exhibitions under the auspices of newly formed gliding clubs is expected to start gliding as a sport in America. A half dozen or more of the best German ships are to be flown in several meets.

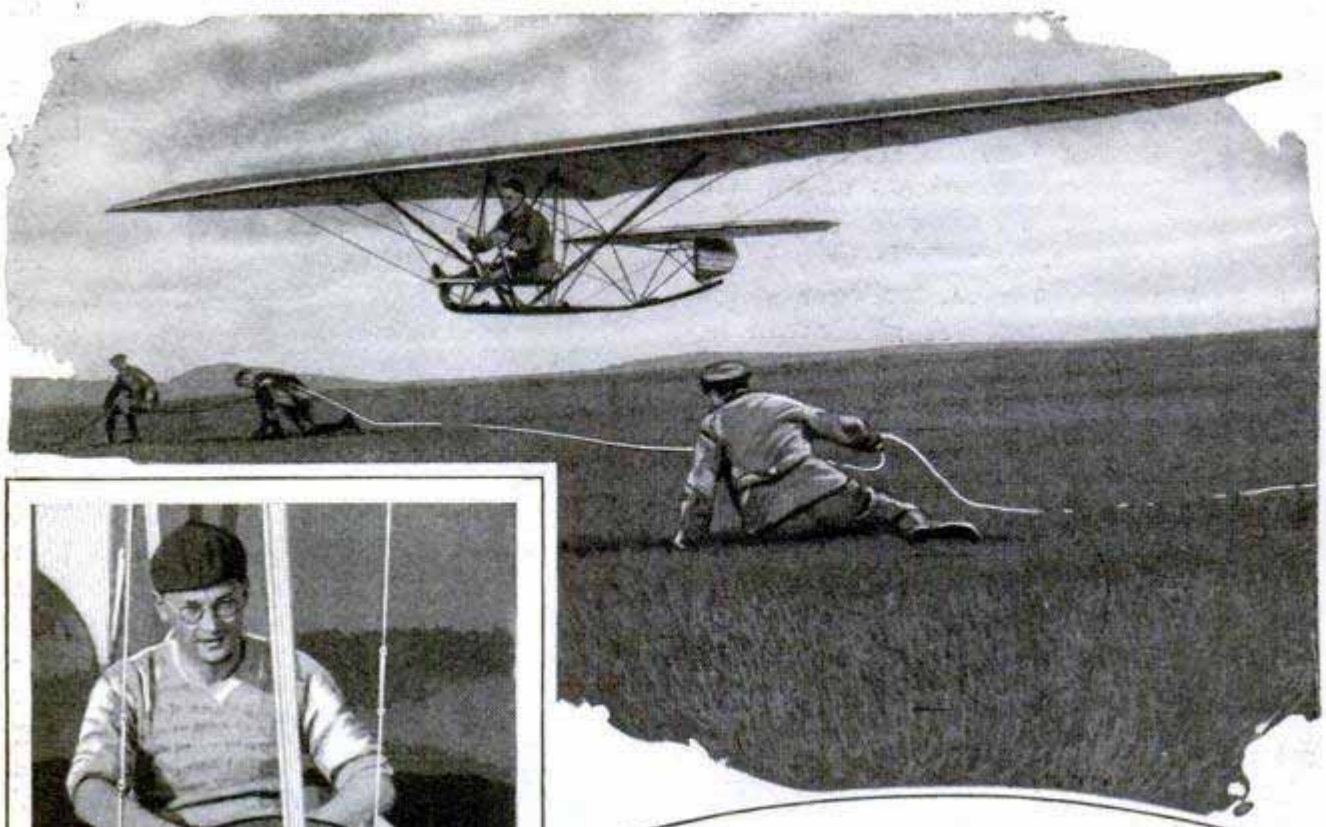
Because of the low first cost, the absence of expensive engine repair and the elimination of all fuel bills, gliding offers cheap aviation for the student. Once the flyer has mastered his machine thoroughly, the Germans have demonstrated the possibility of adding a cheap light engine as an auxiliary, just as the owner of a sailing yacht utilizes a motor auxiliary, to take him on his way when the wind fails. A well-built glider can be powered with a motorcycle or light-car engine, and still be used for gliding when the air currents are favorable.

Few airplane pilots today have had any experience with gliders. Lloyd Bertaud, who lost his life when the "Old Glory" plane disappeared at sea in an attempted flight to Rome last year, was one who got his start that way. Years ago, as a boy, Bertaud built a homemade glider from plans published in Popular Mechanics during the early days of the Wright brothers' experiments.

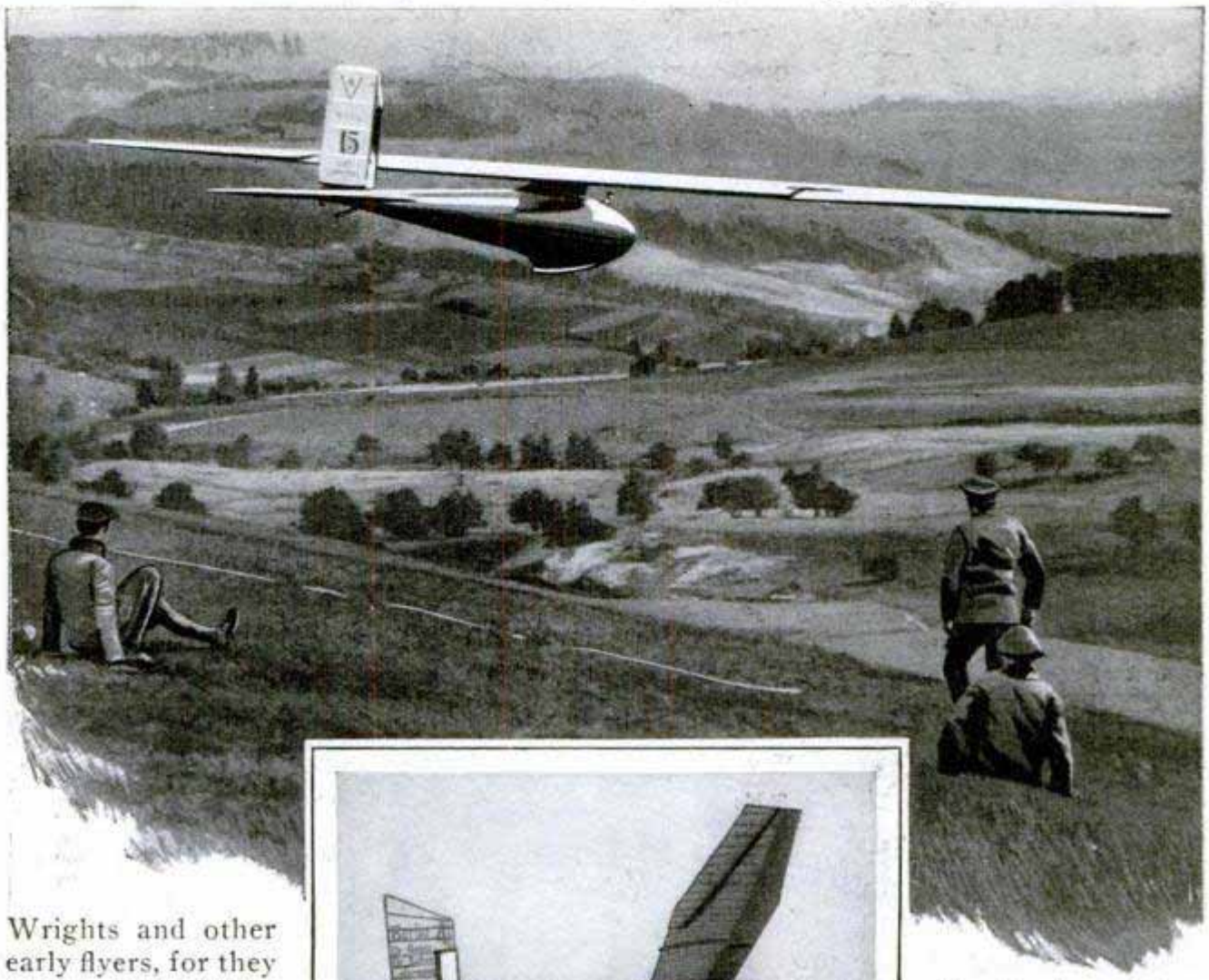
The knowledge of currents gained by experiments was essential to the

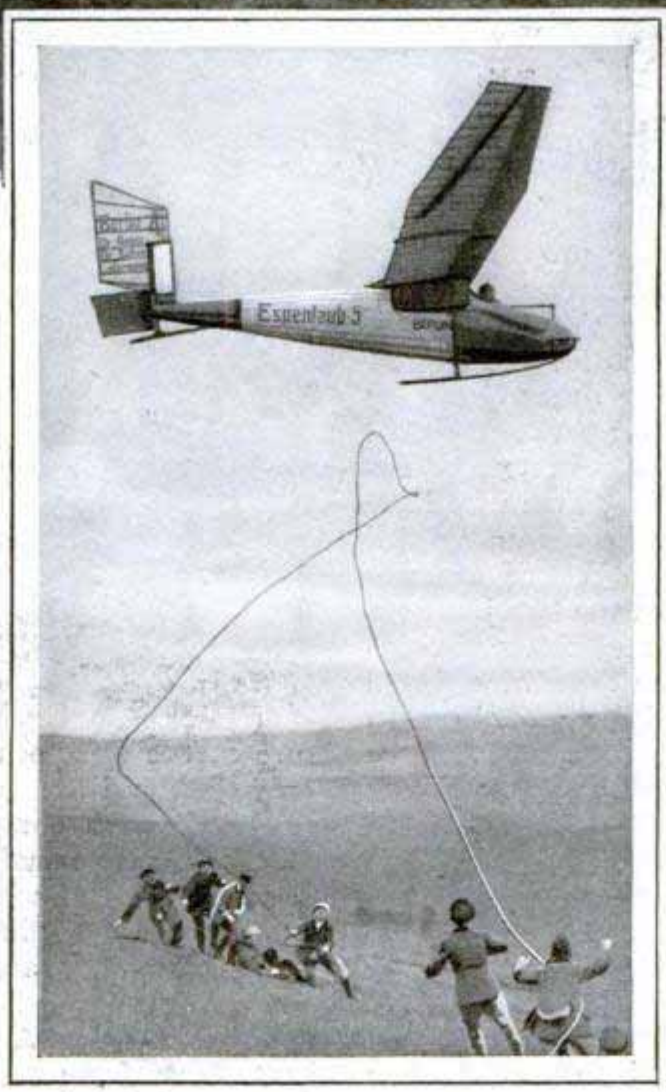


Taking Off in a Glider Built by Breslau Students; the Starting Rope Has Just Been Cast Off by the Pilot; Above, Assembling an Entry in the Rossitten Coast Contest



From the Early Gliders of Lilienthal, Chanute and the Wright Brothers, Flimsy Contraptions of Bamboo and Fabric, Controlled by the Gyrations of the Pilot's Body, to the Modern Gliders with Seats, Control Levers and Even Cockpits, Is a Long Step; Above, Plane Built by Harth, a German Architect of Bamberg, Who, in 1921, Made a Twenty-Five-Minute Soaring Flight, Breaking All Records; at the Left Is the Passenger Car of the "Goetz von Berlichingen," with Pilot Wolff Hirth; Below, Men and Horses Pulling a Contestant to the Top of a Sand Dune for the Start of the Coast Gliding Contests Held by German Flyers Last Year; the Modern Machines, Which Remain in the Air for Hours at a Time, Actually Soar as a Bird on Ascending Currents of Air, Whereas, Prior to Harth's Flight in 1921, All Motorless Planes Simply Glided Down from a Hilltop Start without Means of Controlling the Descent



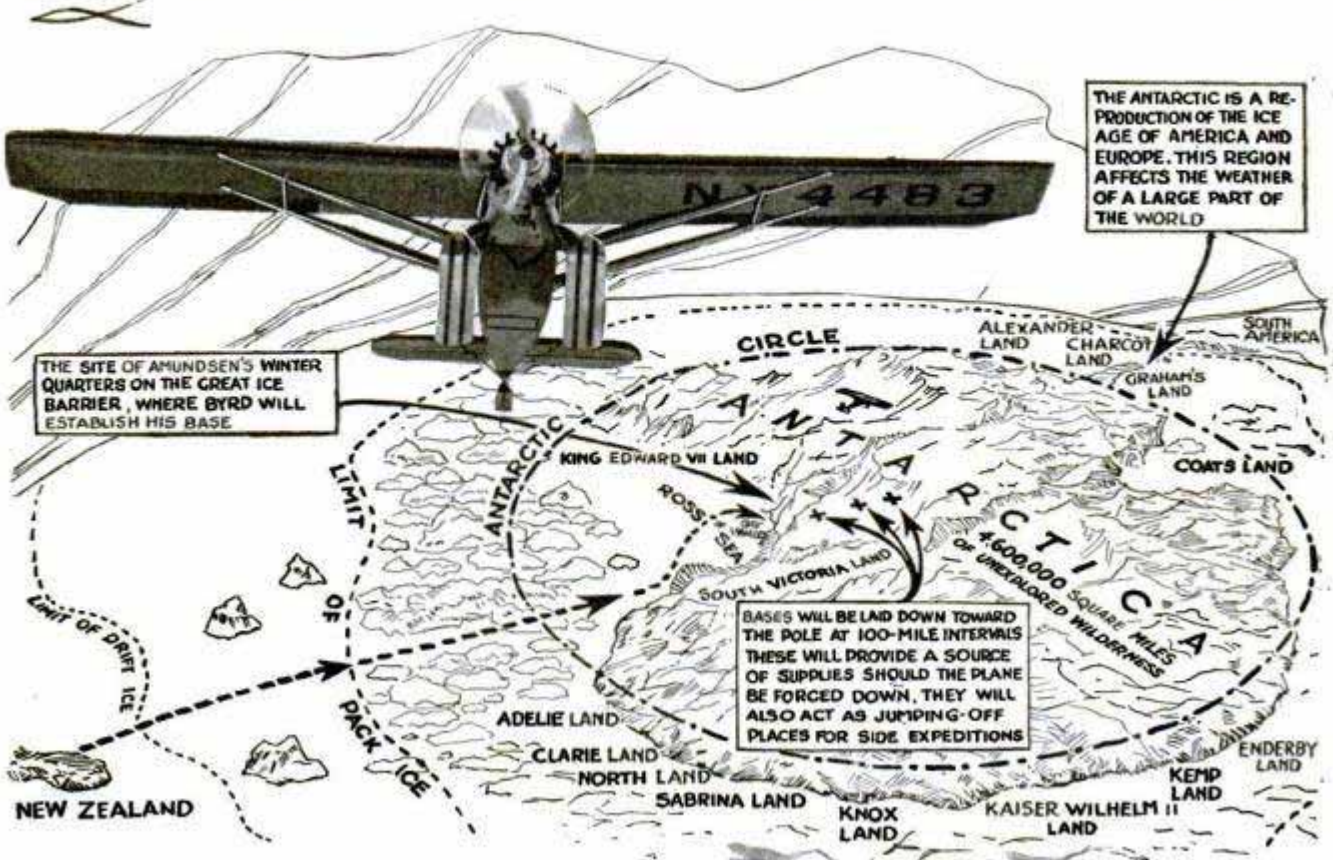


Two of the Latest Types, Showing the Highly Efficient Streamlining and Perfection of Form; That Below Is a Type Used by Espenlaub

Wrights and other early flyers, for they had so little engine power at their command that a moderately strong wind might be fatal, unless they knew how to utilize it to keep aloft. Modern airplanes, with enough power to fly through a sixty-mile gale and still make headway, are practically independent of the wind, so, until the Germans took it up again, kite flying and gliding languished.

Strangely enough, the credit for the revival goes to the statesmen who met at Versailles after the armistice to draft the peace treaty. They had no such object in view, but were merely trying to prevent Germany building up a military aviation force that might again menace the peace of Europe. To accomplish that aim they limited the engine power which could be used in German planes. Denied an outlet for their energies in building high-powered military machines, the German flyers, impoverished by the war, took up soaring flight as a cheap form of sport.

BYRD TO FACE MANY PERILS ON SOUTH-POLE TRIP



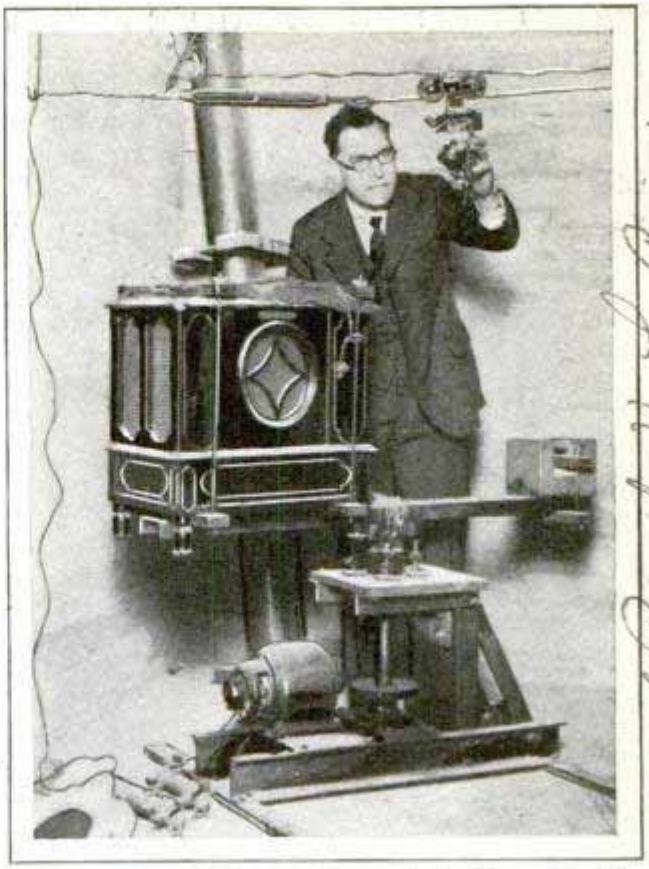
One of Byrd's Planes with Landing Skids on Trial Flight; Map of the Antarctic, and the Commander in Travel Togs

Will Commander Byrd reach the south pole and return? Will his airplanes be of practical service? Is the proposed journey likely to be more hazardous than the north-pole trip? While the explorer is making final preparations for the antarctic dash, these and many other questions are being asked all over the civilized world. The first two cannot now be answered. But, as to the last, men who have been far down among the frozen seas of the south, declare that there is scarcely any comparison between the two journeys on the basis of risks and difficulties involved. The south-pole expedition, in all probability, will be infinitely harder. In the first place, the north pole is at sea level. The south is on a high plateau at an elevation of nearly 10,000 feet. If Byrd flies over, he will have to soar above this rough hurdle, besides facing the difficulties of landing and taking off where the country is a jagged jumble of forbidding ice and the perpetual snow deceives the eye. Then, there is the temperature. Byrd found the weather delightfully mild when he slid over the north pole in his humming Fokker. The mean July temperature at the northern top of the earth is only just a little below freezing. But summer, which comes in January in the antarctic, is normally as much as fifty degrees colder. Scott had to fight through temperatures of nineteen degrees below zero, Fahrenheit, and lower, on his fatal south-pole journey. The third factor is the severe wind. A ten-day blizzard that kept Scott from reaching a depot only eleven miles away, proved his undoing. These storms commonly spring up with

great suddenness, explorers state, sometimes attaining a velocity of 150 miles an hour in gusts. They drag a drift of snow along with them, blotting out the landscape below, although the sun may be shining clearly just above the ice cloud. These are the principal hazards that face the man who would conquer the south pole. But there are bright sides to the picture. In spite of storms, periods of clear, fine weather are not uncommon. The ice cap presents a better landing surface for planes than the pack ice, such as was found over the north pole, and the speedy craft of the air will swallow up the distances and greatly diminish the time required for travel, an exceedingly important factor if the explorer goes on foot or by dog sled.

"SAFETY CITY" SHOWS HOW TO AVOID ACCIDENTS

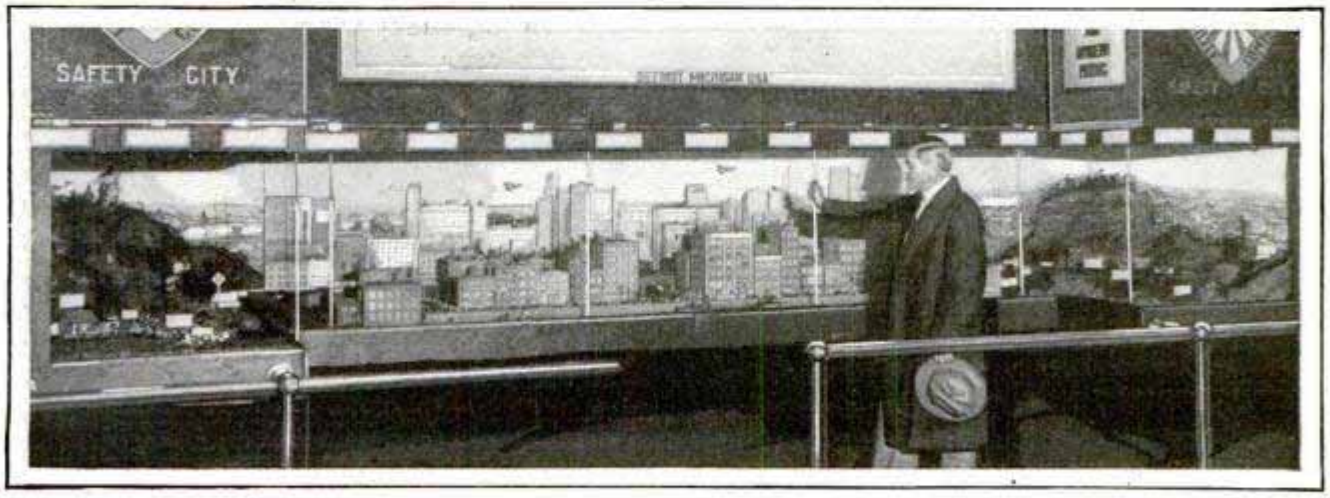
Miniature traffic accidents of all kinds occur in a twenty-foot model of the city of Detroit, to illustrate the results of improper driving and disregard for safety signs. The display, which is an accurate reproduction of the main part of the city, with streets, buildings and other details built to scale, has been arranged for a tour of the state to teach safety lessons. Special lighting effects have been created, whereby darkness appears to fall upon the tiny city. Moon and stars appear, auto headlights are turned on, train and boat signals are lighted, and electric signs blaze forth. Miniature machinery runs in the tiny factory building, and the entire model reproduces the busy life and traffic.



Noise Producer in Use, and Part of the Measuring Apparatus at Bureau of Standards

TESTS WITH MAN-MADE NOISES MEASURE INSULATION

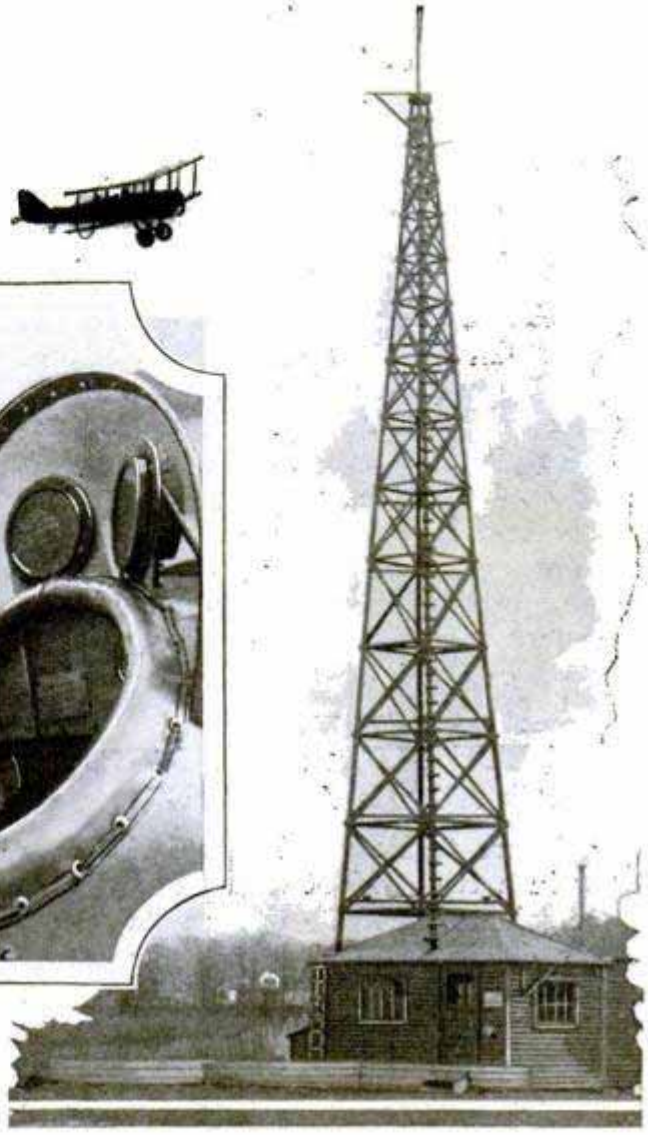
Scientists at the bureau of standards have devised various noise-making instruments for the purpose of testing the soundproof qualities of insulating materials submitted for examination. One of the noise units is a crystal of quartz, through which an electric current is passed, producing a definite sound. The intensity of noises made in this way can be accurately determined so that the results of the tests on the samples will be far more conclusive.



Animated Model of Detroit; Small Lights Flash, Tiny Cars and Autos Glide About, and Regular Traffic Conditions Are Duplicated to Teach Safety Lessons

RADIO BEACON TO GUIDE PLANE ELIMINATES HEADPHONES

Guiding airplanes by means of a radio control, which tells the pilot by an audible signal when he departs from the right course, is now improved in an apparatus



Plane Equipped with the New Radio-Pilot Instrument, and, at Right, a Guide Tower

which eliminates the use of headphones. Instead of listening to a signal, the pilot simply has to watch a little dial instrument in the cockpit. A pointer on the unit will tell him if he is flying in the right direction. The sensitive indicator is affected by a radio beacon anywhere within 100 miles of the moving plane. Successful tests have been made with the new guide, and several of them are in use.

TATTOO TO MARK PET STOCK HELPS PREVENT THEFT

To identify small animals and poultry, a tattoo marker, that can be carried in the vest pocket when not in use, has space for one, two or three characters at once and is so adjusted that the units cannot be put in upside down. The instrument is especially adapted to use on rabbits, calves, sheep and poultry, the latter being marked on the inside web of the wing. An indelible ink, applied with the marker, insures a lasting identification.

AFRICAN HUNTERS "BAG" GRASS FOR U. S. FARMS

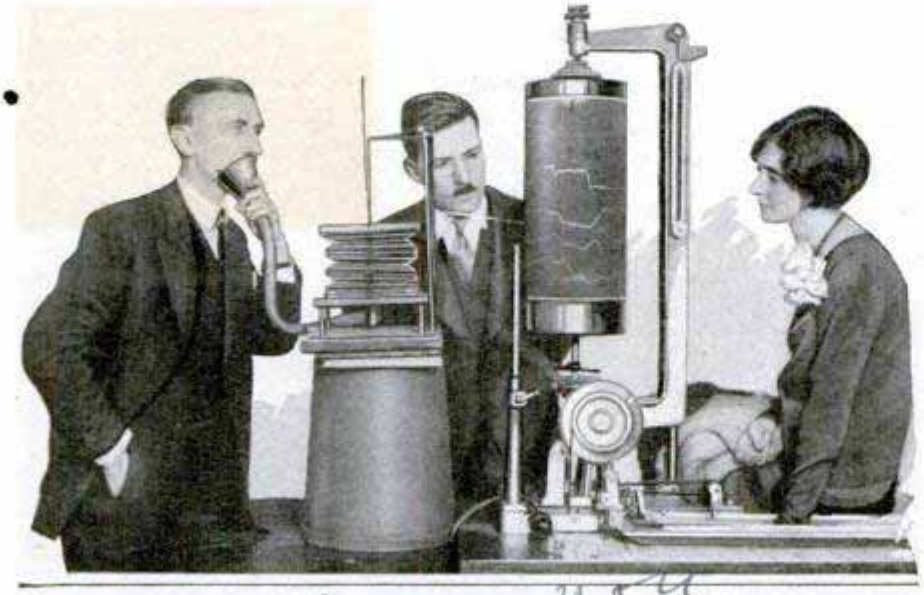
To reduce the cost of raising live stock by providing cheaper and better pasturage, plant explorers of the department of agriculture have just completed a nine months' search in African jungles, where they collected a large number of samples of different kinds of grass seed. These will be planted in this country, to test them out under different soil and climatic conditions in the hope that some variety may be found that will thrive, stay green longer than the domestic kinds and be easier to raise. The collection gathered comprises about seventy-five per cent of the forage grasses that grow in the highlands of Kenya and Tanganyika, formerly known as British and German East Africa.

QUAKES AT SLEEPING VOLCANO NUMBER SEVERAL IN DAY

Mt. Lassen, America's chief active volcano, is sleeping, but its slumber is troubled, for earthquakes are constantly occurring near it, sometimes several in one day, and the peak constantly gives off clouds of steam. Within 100 miles of the volcano are hot beds of pumicestone and lava areas which were formed within recent times, geologically speaking. By digging off the surface of the pumice area, much higher temperatures are recorded. R. H. Finch, of the geological survey, whose work is to "keep his finger on the pulse" of the sleeping volcano, is making attempts to photograph the summit and to obtain accurate temperature measurements. The Indians say that a mountain near the peak has been hot for many years, and earthquakes, with attendant rattling noises, have been observed by the forest service for at least fifteen years.

GRAPHIC RECORDER OF VOICES AIDS LANGUAGE STUDY

Persons of different nationalities pronounce the same sounds by using their speech organs in different ways, and to determine just what the difference is, the University of Chicago employs an apparatus that makes a graphic picture in waving lines, of the sound as pronounced. As the breath is expended, the lips moved and other processes in speech performed, the result is recorded on a moving cylinder.



Making a Voice Picture to Study Speech Methods; the Sound Vibrations Are Traced in Wavy Lines on Cylinder

One of the Porcelain Bells for a Chapel at Meissen, Germany; the Figures Affect the Tuning

FORTY BELLS OF PORCELAIN TO STRIKE CHAPEL CHIMES

Instead of being cast in metal, the forty bells for chimes in a chapel at Meissen, Germany, are being fashioned of porcelain. More than twenty of them are already completed and have been tested. Since each has different decorations, it requires special tuning. This is done by grinding. The bells are to be suspended by stout straps. Other details of the chapel are to be made of porcelain. Among them are a number of human figures, some weighing as much as 600 pounds.

MAGNETIC PENCIL FOR DOCTOR

Bits of metal are removed from the eyes and other parts of the body with a magnetic pencil of cobalt steel, one of the latest units added to the emergency kit. It is about the size of a lead pencil and has been successfully used where an operation with a knife might otherwise have been necessary.

3843

The Man On Foot

Guns That Aim Themselves, Giant Electrical Ears and Fingers of Light Meet Air Menace

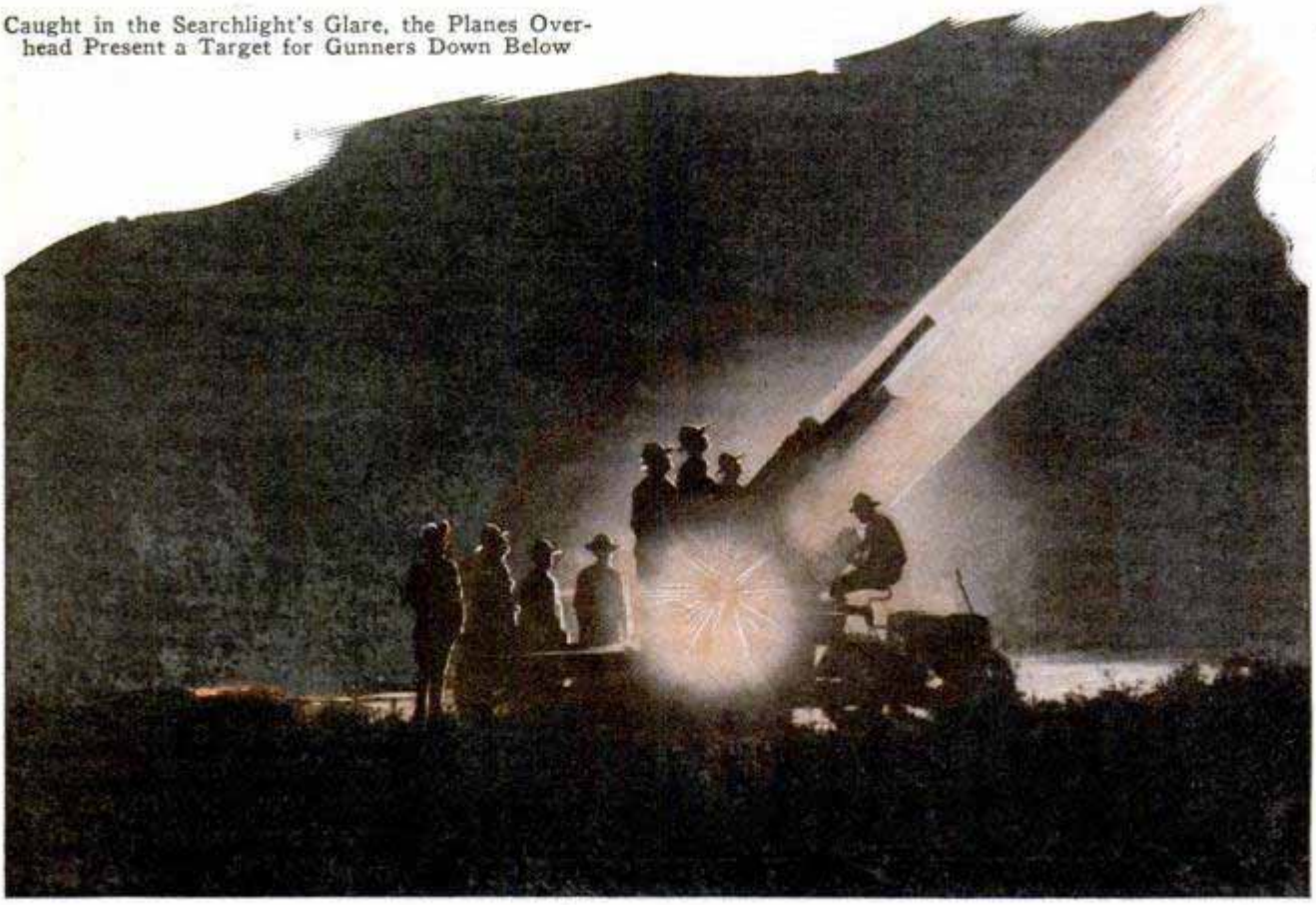
WARS of the future will be battles between mechanized wizards, mute masses of steel energized by electricity, seemingly endowed with almost human intelligence.

Mammoth guns with "eyes," which see the enemy many miles away, and which can hurl huge projectiles with remarkable accuracy farther than the length of a Marathon race course, add new efficiency to tomorrow's wars.

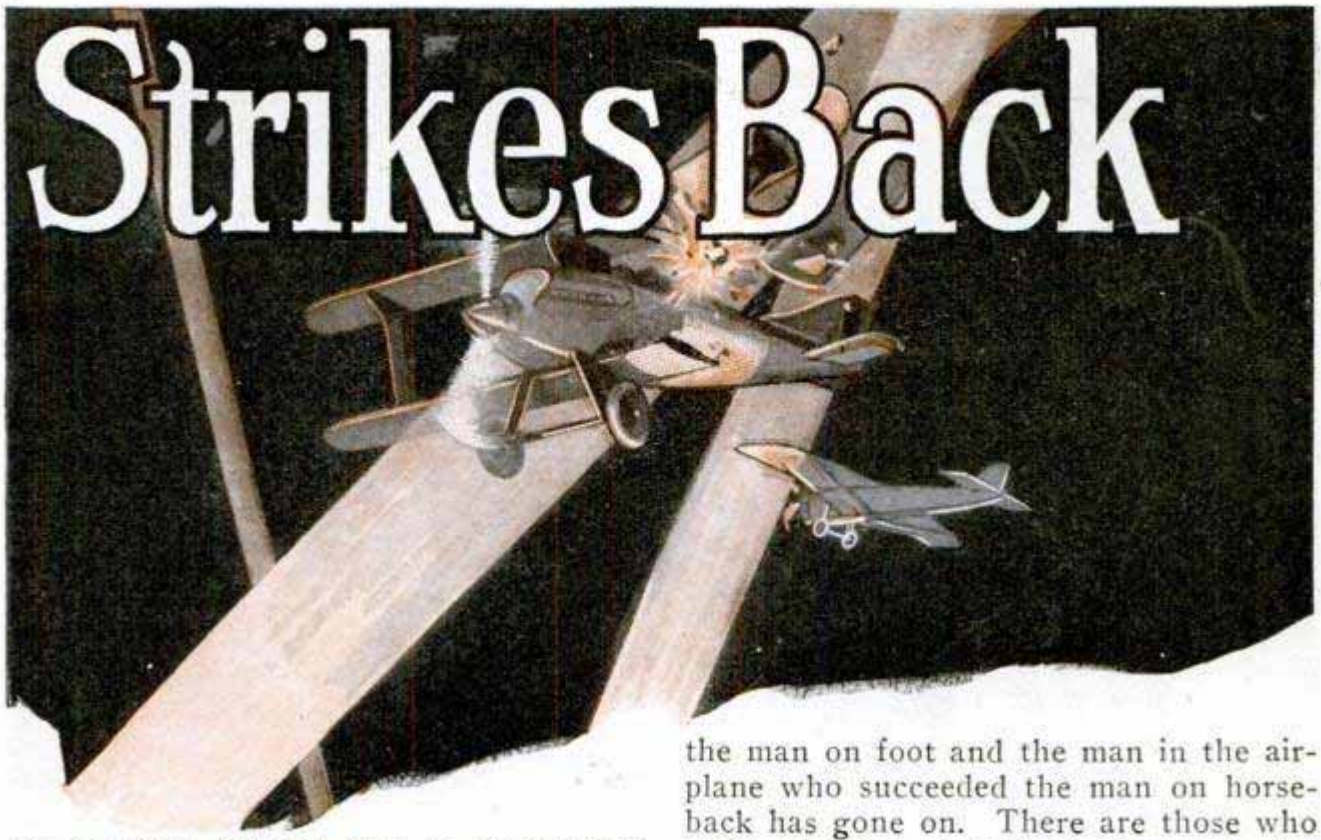
Substitute suns—far-sighted searchlights—make fighting at night almost as deadly as by day. Sound recorders give notice of the rhythmic purring of enemy airplanes many miles away. Anti-aircraft guns, in battery formation, which are sighted and directed by electricity, are fired by cannoneers with wonderful accuracy despite the fact that the targets at which they shoot are speeding airplanes rushing onward at speeds of one and one-half to two miles or more a minute.

On a day in October, in the year 1415, a little army of English archers waited behind its improvised defenses near the village of Agincourt, while a great host of French knights rode clanking toward them. Nothing short of annihilation seemed to be in store for the English, for what could all but unarmored foot soldiery do against mailed men on horseback? But

Caught in the Searchlight's Glare, the Planes Overhead Present a Target for Gunners Down Below



Strikes Back



the bowmen did not stop to discuss the relative merits of heavy cavalry and light infantry. They merely looked to their bowstrings and selected the best of their long steel-tipped shafts. And, at the end, above the heaped dead, there lay invisible the mightiest corpse of all—the tradition of the superiority of the man on horseback over the man on foot.

The succeeding centuries only emphasized the lesson of Agincourt. But when Armageddon broke upon the world, fourteen years ago, the man on foot found his reign threatened. The man on horseback came back in a new guise, mounted not on a steed of flesh but on a roaring mechanical dragon with wings. They fought each other in the air, in true knightly style; they raided and ruined cities, they tore along just above the treetops and lashed downward at the men on foot beneath them with weapons the old knights had never dreamed of—machine guns, high-explosive bombs, clouds of choking gas or blinding smoke. The men on foot tried to strike back with such weapons as they could improvise, but, for the most part, the fire of the war-time "archies" and high-angle machine guns was of so little effect that the new chivalry treated it with contempt.

Since the armistice, the debate between the man on foot and the man in the airplane who succeeded the man on horseback has gone on. There are those who claim complete and final supremacy for the man in the plane, and say that nothing is left for the man on the ground but the choice between surrender and annihilation. They are opposed by those who declare that the planes, though mighty, are still in a measure subject to the limitations of all highly mobile forces; that they have considerable striking force but no holding power, and that the advantages they gain in the first rush must be further exploited and then stabilized by the slower-moving but harder-holding ground troops. And finally, say those who still see a chance for the man on foot, his last shaft is by no means spent. Even the crude anti-aircraft weapons of the World war, they point out, were able to make the planes keep to a respectful altitude when they were competently handled, and post-war advances in material and technique of aircraft defense have at least kept pace with the progress in airplane construction and aviation. So it may come to pass that one of the vast airplane fleets, which some journalists are always dreaming about, will some day rush to its destruction at an Agincourt of the air.

Taking little part in the heated discussions of whether weapons on the ground can strike effectively against planes, but seeking more successfully for an answer in

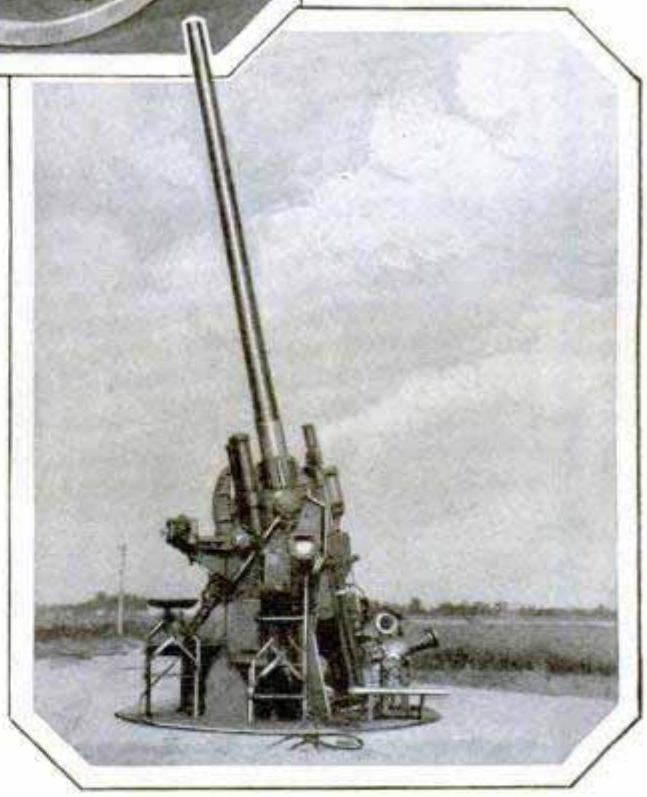
laboratory and shop and on the proving grounds, the army is constantly working to improve existing weapons and to devise new ones wherewith the man on foot may defend himself against the riders of the air.

The outstanding difficulty with ground defense against aircraft during the war, and indeed until within the last few months, was the difficulty of getting the fire of the high-angle guns anywhere near the target. Marking down a horseman with a clothyard shaft at fourscore paces is a simple problem as compared with potting a plane high up among the clouds at a hundred times that distance. The archer had it a great deal easier than the "archie."

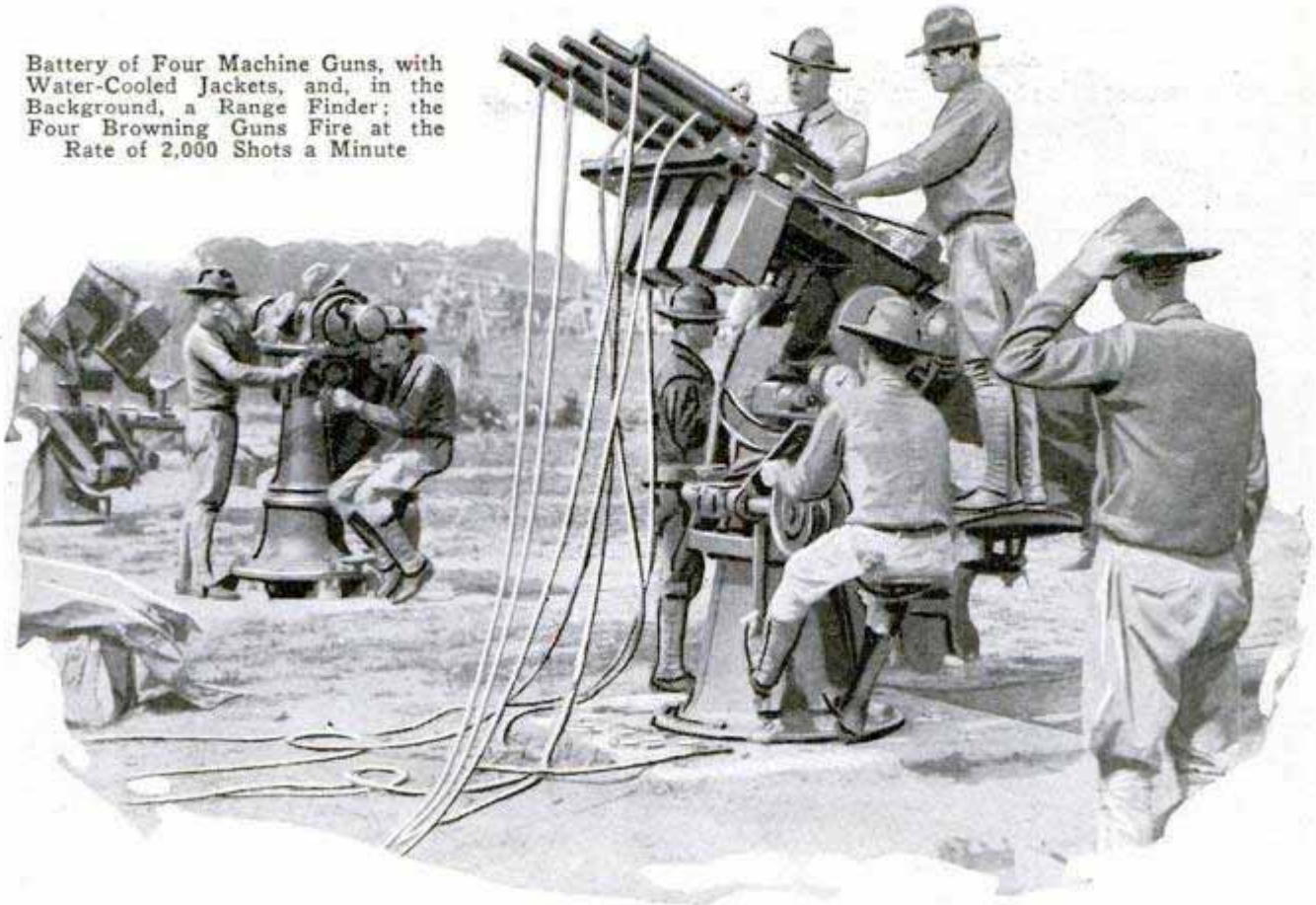
The practical solution of this problem, enabling the commander of an anti-aircraft battery to train all of his guns as a unit on a single target, is the greatest accomplishment of the ordnance department, greater even than the development of the several excellent guns and mounts which have become the standards for our land defenses against attack from the air. The new fire-control instrument for anti-aircraft guns (it hasn't received a compact name as yet) is the sensation of the day among artillery experts. It is so good that it has already begun to be a legend—newspaper accounts have attributed almost miraculous powers to it. One widely circulated story declared that it picks up the sound of the approaching plane and automatically trains the gun on it, without the intervention of any human direction at all.

This is a little too much of a good thing, but even the sober facts are remarkable enough. Manned by a few competent operators, the machine really will automatically compute all the firing data necessary for the handling of a battery attacking a target at any range and altitude.

The operation of the instrument is simple enough in itself; the complicated parts of the business are all mechanical and have been taken care of in advance by the ingenious inventors who constructed it. Two observers keep telescopic eyepieces



Portable Searchlight, Top; Sixty-Inch Aluminum-Alloy Casting for the Light, and, Below, the Army's New Anti-Aircraft Gun



Battery of Four Machine Guns, with Water-Cooled Jackets, and, in the Background, a Range Finder; the Four Browning Guns Fire at the Rate of 2,000 Shots a Minute

trained on the attacking plane. One of them follows all horizontal movements, and the other all risings and fallings of the target. The internal mechanisms in which these telescopes are mounted actuate indicators on dials, from which the data may be read off directly. Factors other than those of horizontal and vertical position, such as timing of the shell fuse, etc., are "fed in" by other operators at appropriate dials.

The firing data can be transmitted to the guns in any one of three ways. The simplest method consists merely in telephoning the figures to the gun pointers, who then lay their weapons in the usual manner. The second method is what is called the "follow-the-pointer" system. Data dials similar to those on the fire-control instrument itself are located at the guns, with pointers that move synchronously with those of the control instrument. The task of the gunners then is to operate their handwheels so that a second pointer on each dial follows faithfully the movements of the first. The more nearly perfect they are able to make this following of the pointer, the more accurate is the training of the guns.

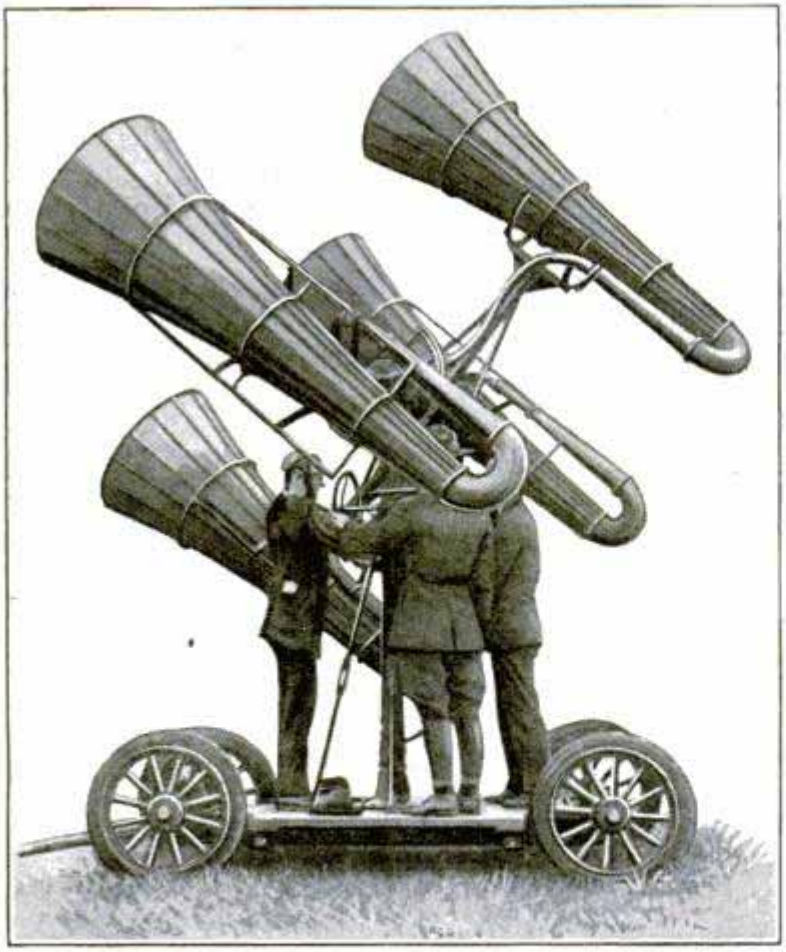
The third system, which is the real sensation maker, is entirely automatic in its operation. Electrical connections run from the fire-control instrument to each gun in the battery, applying the mechanically computed data by means of motors geared to the training mechanism of the guns. The fuse setters, which time the burst of the projectiles, are also held to identical settings for all the guns by the same device. It is an uncanny sight to see a battery of guns, wholly deserted by their crews, following with their muzzles every movement of a speeding target in the clouds, almost as if they were alive. This automatic method places the whole work of training the guns in the hands of the battery commander, and leaves the gun crews nothing to do but shove the noses of their projectiles into the fuse setters for a moment, slam them into the breeches of their pieces and pull the lanyards. This makes for very rapid and uninterrupted fire.

The automatic training of all the guns in a battery—which can, if desired, be extended to all the guns in any number of batteries—is probably at the bottom of the extravagant stories about the superhuman powers of the new fire-control instrument. One other factor has probably contributed

to the spread of the reports. For picking up approaching planes at night, a listening instrument is the main reliance of the fire-control detail. This looks like four huge loud-speaker horns, all pointed in the same direction, with ear tubes like an exaggerated stethoscope attached at their lower ends. When the listener hears the roar of the motor at its loudest, the instrument is pointed approximately at the approaching plane, and the position, transmitted electrically to the waiting searchlights, is at once stabbed by their beams. A little feeling around by these huge antennæ of light, and the target flashes into view. Then, but not until then, do the observers at the fire-control instrument go to work.

But this is far from training the guns directly on the target merely by picking up the sound of the motor. Position finding by sound alone, even on a much less delicate footing than this, is not practicable, because sound does not proceed in straight lines as light does, but is subject to change of intensity and apparent direction by winds, layers of air of differing density and temperature, clouds and other reflecting surfaces, and a number of other factors. At best, the auditory position finder can only approximately locate its target. Within its limits it is a great help to the searchlights. But a performer of military miracles it certainly is not.

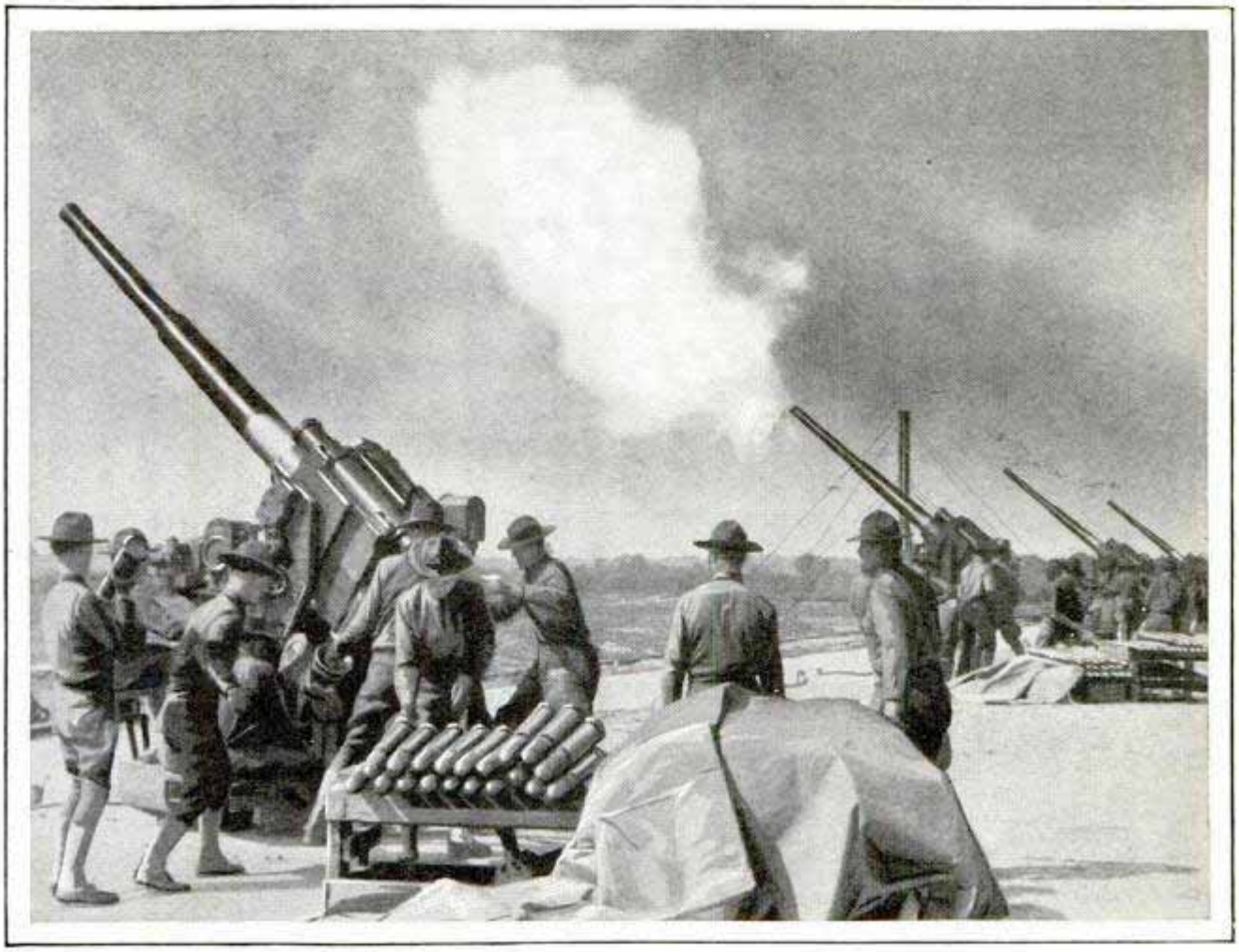
There are several weapons specially designed for attack on aircraft, each very worthy and well adapted for its own particular purpose. The backbone of the anti-aircraft service is the new three-inch high-angle gun. This is the type of weapon now being installed for the protection of the locks and harbor works at Panama. It can throw a fifteen-pound projectile to a height of 10,000 yards and has an extreme horizontal range of 15,000 yards. A rate of fire of twenty-eight shots per minute has been attained with this weapon. That means that a battery of four of these pieces could hurl at an enemy plane nearly a ton of steel and high explosive in a burst of fire lasting one minute. During the past year the improvements in this piece and its control have made possible a doubling of the hits scored, in half the former time and at twice the former range, concisely, an 800-per-cent increase in efficiency.



The Ears of the Anti-Aircraft Gunners Are This Battery of Super-Sensitive Sound Collectors

The three-inch anti-aircraft cannon has a formidable big brother in the new 105-millimeter, or 4.1-inch, high-angle rifle, a very long-barreled, powerful weapon that can throw its thirty-three-pound projectile to a height of 12,000 yards and an extreme range of 19,000 yards, or over ten miles. It is a slower-speaking piece than the three-inch, firing only fifteen times a minute, but the greater weight and range of its projectiles more than even up the score.

Because of the great length and considerable weight of the fixed ammunition for this gun, the operations of loading and of ejecting the empty cartridge case after firing have been made almost entirely automatic. The three-inch gun is semi-automatic; that is, its breech block is snapped home by a strong spring as the cartridge slides into the chamber, but after firing, the breech has to be opened



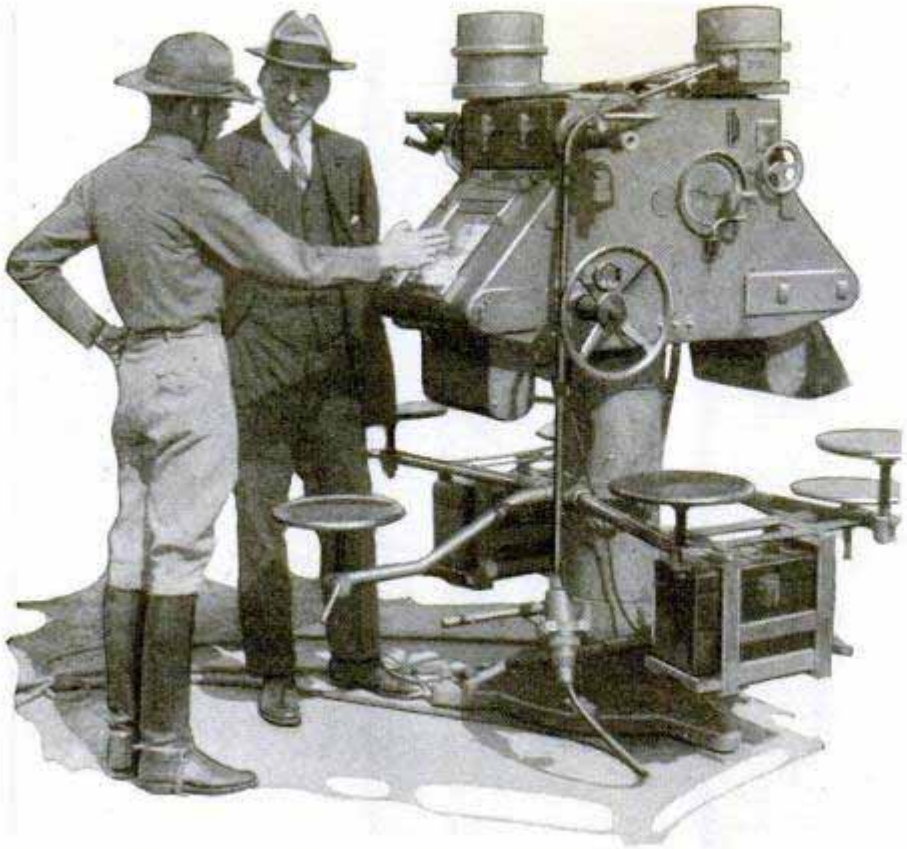
Anti-Aircraft Guns Which Aim Themselves, Being Tested at Aberdeen Proving Ground; a Sensitive Sound Pick-Up Points the Weapon Directly at the Source of the Sound

by one of the cannoneers. The breech mechanism of the 105-millimeter piece, however, is too heavy to be operated manually at the necessary speed without wearing out the cannoneer in a few rounds. Accordingly, the long cartridge is laid in a tray extending backward from the breech and a pneumatic rammer shoves it home. As it clears the breech block, the projecting rim at its base trips a trigger, which allows the spring-pulled block to slide up into place and finish seating the cartridge. The gun is now ready to fire. When it is fired, the force of the recoil is utilized by means of an ingenious cam arrangement to open the breech block and eject the empty cartridge case, and also to return the pneumatic rammer to compression position, ready to load another charge into the chamber.

The ammunition in these two guns represents a great advance over that used during the war. Then, because of the unreliability of time fuses, shrapnel was usually employed. This type of projectile fills the air with a shower of leaden pellets, shotgun fashion, and is an ideal weapon against infantry or other scattered targets. But it isn't so good against a narrow target like an airplane, for it was practically necessary to score a hit on the aviator himself in order to bring down the plane.

Nowadays a high-explosive shell is used, for post-war development in time fuses has made it possible to make sure of bursts within fifty yards of the target. At this distance the aviator is exposed not only to the flying splinters but to the stunning concussion caused by the explosion, which may cause him to lose consciousness for a few fatal seconds.

A third gun which has been developed for anti-aircraft work is perhaps the most vicious-seeming of the whole family when it is seen in operation, though it is only a little one. This is the thirty-seven-millimeter rifle, an automatic. It fires shells weighing about one pound at the rate of ninety shots per gun per minute. During night firing, when tracer ammunition is used, the trajectory can be seen drawn against the dark like a fiery dotted line.



The Brain of the Automatically Pointed Gun Is This Instrument, Which Locates the Plane and Directs the Weapon

The light shells of the thirty-seven-millimeter gun differ from those of its larger brothers in that they are designed to burst on contact instead of by a time fuse. That is, a shell actually has to hit a plane before it can explode. But when it does, the effect is ruinous. Half a wing, or the whole of the rudder apparatus, simply vanishes. So much has been determined by trial on fabric targets, but what would happen should one of these little shells chance to hit a loaded-bomb rack had better be left to the imagination.

In order to function upon contact with so slight an obstacle as the fabric of an airplane wing, the fuse of this shell, of course, has to be of almost unimaginable delicacy and quickness. This has been achieved by means of a most ingenious principle. The plunger that fires the detonating cap poises ready to strike the moment the projectile clears the gun. But it is prevented from striking by the pressure of a tiny column of air admitted through a hole bored in the nose of the shell. So long as the projectile is in flight, this pressure is maintained. But if any obstacle, however slight, closes the hole for even an instant, the restraining air pressure is removed long enough for the plunger to strike home and detonate the explosive charge. Shells of this type, fired through a thunder shower, have exploded on striking large raindrops.

These various types of attack with shells are best adapted for the high-flying planes—bombers and observation planes. The low-flying "hedge hopper," which just skims above the tops of the trees, demoralizing columns of troops and ruining transport trains with machine-gun fire and light bombs planted neatly in rows, is difficult to find with weapons as large as these. Even the comparatively agile thirty-seven-millimeter automatic is hardly quick enough on the turn to catch these flyers. Yet they have to be met, for all armies now have planes designed especially for this very type of combat. One of the new Curtiss planes, for example, carries three machine guns pointing forward and one in the rear cockpit for the observer, besides racks for a large number of light bombs. Most of these ground-attack planes, moreover, carry light armor around the cockpit, to protect the crew and the vital machinery from ordinary fire.

To crack this nut, the .50-caliber machine gun has been developed. It is the same in general construction as the .30-caliber Browning heavy machine gun, except that it throws a massive cigar-shaped bullet, half an inch in diameter and weighing about two ounces. The light steel plates an airplane is able to carry cannot deny entrance to such messengers as these, and what they hit they break, whether it be an engine valve or a steering control, or human flesh and bone. To make matters doubly sure, a mount has been devised by which four of these guns can be trained on the same target by a single gunner. This quadruple weapon delivers two-ounce slugs at a rate of thirty a second —a veritable hurricane of death.

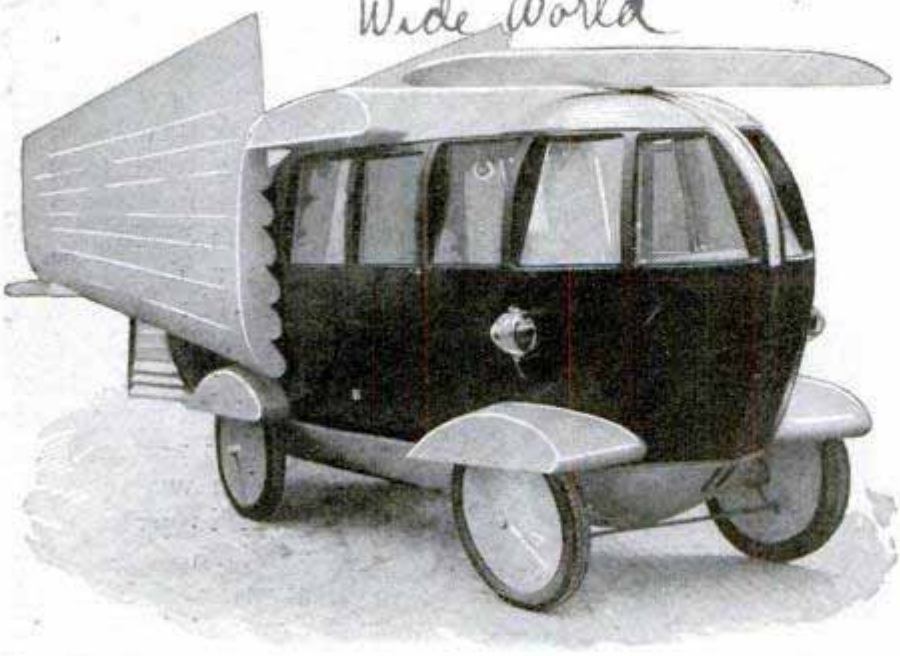
And so the man on foot stands again where he stood on the morning of Agincourt. Whether he can prevail against the chivalry that may ride to oppose him, no man is now able to say. He himself makes no boast. He only looks to his bowstring and picks out the best of his long steel-tipped shafts.

MATTRESS OF RUBBER TUBES IS EASILY CARRIED

Rolled into a small package of little weight when not in use, an inflated mattress of rubber tubes has been devised by a western physician. There are twelve tubes, each in a cloth case and with a valve for inflating. The casing is washable. The entire mattress weighs but a few pounds and, since it can be carried in small space, is particularly adapted to camping and automobile trips.

AUTO THAT FLIES ALSO SERVES AS FAST MOTORBOAT

Tourists of the future will be able to use the same conveyance for travel by land, water or air if a British craft, recently exhibited, proves successful. It is a combination automobile, motorboat and airplane, with wings that fold back, tail fin, rudder and two propellers. A sheltered cabin holds several passengers and little time is needed to change the vehicle for different modes of travel.

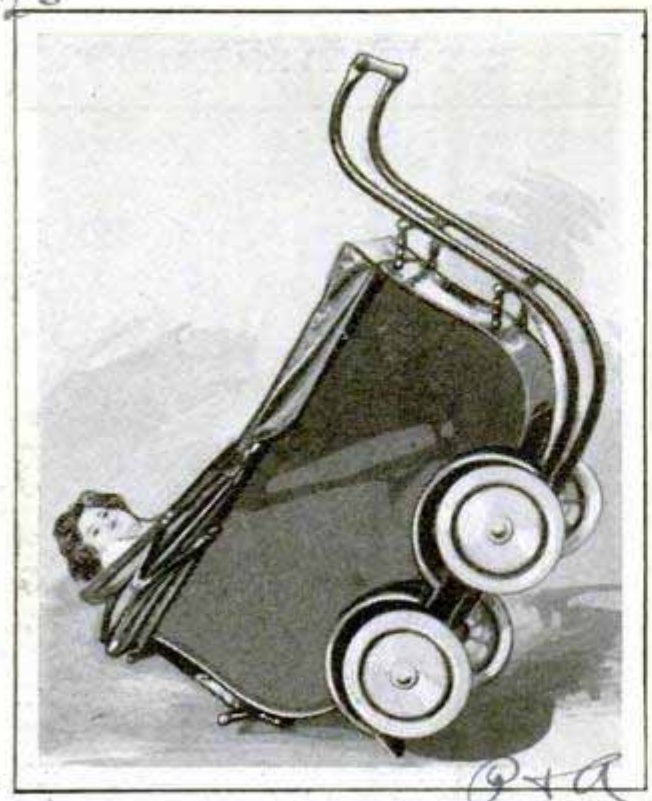


For Travel by Land, Air or Water; the Vehicle That Combines in One a Plane, Auto and Motorboat

COIN-IN-SLOT BASEBALL GAME TESTS PLAYERS' SKILL

Young Woman Is Manipulating the Bat, Man at Her Left Is the Pitcher; Scoreboard at Far Corner

Many of the thrills of a real baseball game are afforded in a coin-in-the-slot playing cabinet which permits two persons to enjoy five innings at a time, and also keeps accurate score of the runs, hits and batting averages. One player acts as pitcher, delivering the balls—small steel spheres—from a slot on the field by turning a crank. His opponent, as batsman, turns a handle which swings a small steel bat, mounted on a pivot. As the balls are struck, they roll into compartments at the rear of the field or drop into holes, with the result that miniature men pop up from the home plate and are carried along for one, two or three-base hits or homeruns, according to the place where the ball landed. This action is obtained by an arrangement of gears and levers inside the cabinet. Scores are automatically registered on a board as each play is made. Since positions that will bring in runs or result in hits are marked, the batter has a chance to exercise his skill in endeavoring to send the ball into the winning areas. The machine is operated by electric current from a wall socket.



It Will Tip But Won't Fall Over; the Specially Suspended Baby Carriage at a Steep Angle

BABY CARRIAGE WON'T TIP OVER WHILE CROSSING CURB

Securely suspended from a frame of springs instead of by straps, a perambulator is so balanced that it is not likely to be tipped on end while going over street curbs or similar obstacles. The body is deep and safe and the entire vehicle durably constructed. At an exhibition in London, tests were staged to show how carefully it has been designed.

FIREPROOF AIRPLANE DOPE INVENTED BY STUDENT

Coating the airplane wings with special materials to make them stronger and proof against moisture has an added advantage with a substance recently developed by an aviation student in Indiana. His preparation is claimed to be fireproof so that the wings are protected against both fire and water. Exacting tests have been successful.

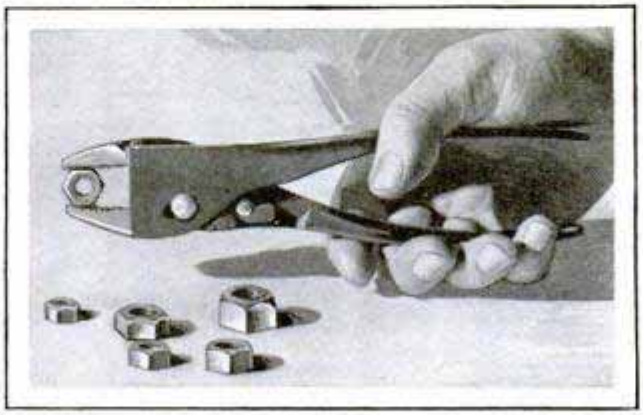
C. J. Boss, student at the [illegible] School of Aeronautics

X-RAY "FINGERPRINTS" OF ROCKS TO AID INDUSTRY

By preparing thin sections of rocks and taking X-ray photographs of them, scientists of the University of Wisconsin have compiled an interesting library of mineral and other "fingerprints," to identify different specimens. More than 600 of these "autographs" are now included in the collection. According to Prof. A. N. Winchell everything solid is crystalline, and every crystal of the same kind in mineral substances produces its own characteristic autograph. By comparing the photo of an unknown specimen with that of a known substance, identification is often easily made. The method is believed to have great possibilities for various industries. For instance, if a sample of graphite paint to be used in preventing rust, is suspected of containing more shale than graphite, an X-ray exposure would reveal the true composition, although shale and graphite are much alike in outward appearance. The rays reveal that a diamond is formed of closely packed carbon. Graphite is also carbon, but loosely packed and of different pattern. Examination of cement, ores, slag and porcelain products can be accurately made by the X-ray system.

PLIERS WITH PARALLEL JAWS GET PERFECT GRIP

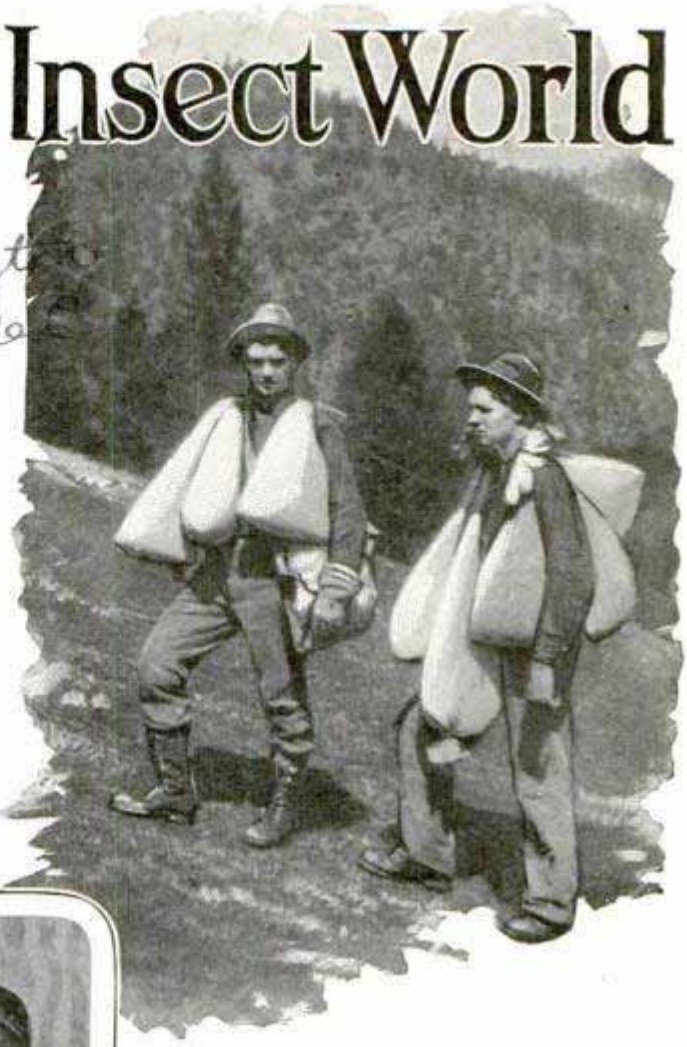
Pliers which adjust themselves to any object within their range, while keeping the jaws parallel to provide a perfect grip, have been invented by a Chicago man and are now on the market. Instead of putting the strain on the connecting pin, the new pliers provide a double fulcrum between two lugs. With the jaws parallel, they can hold a piece of pipe as perfectly as a pipe wrench. A pawl is provided which can be swung aside, or dropped into place to adjust the jaws for small work.



Parallel-Jaw Pliers Employing Double Fulcrum to Increase Gripping Pressure

Tigers of the Insect World

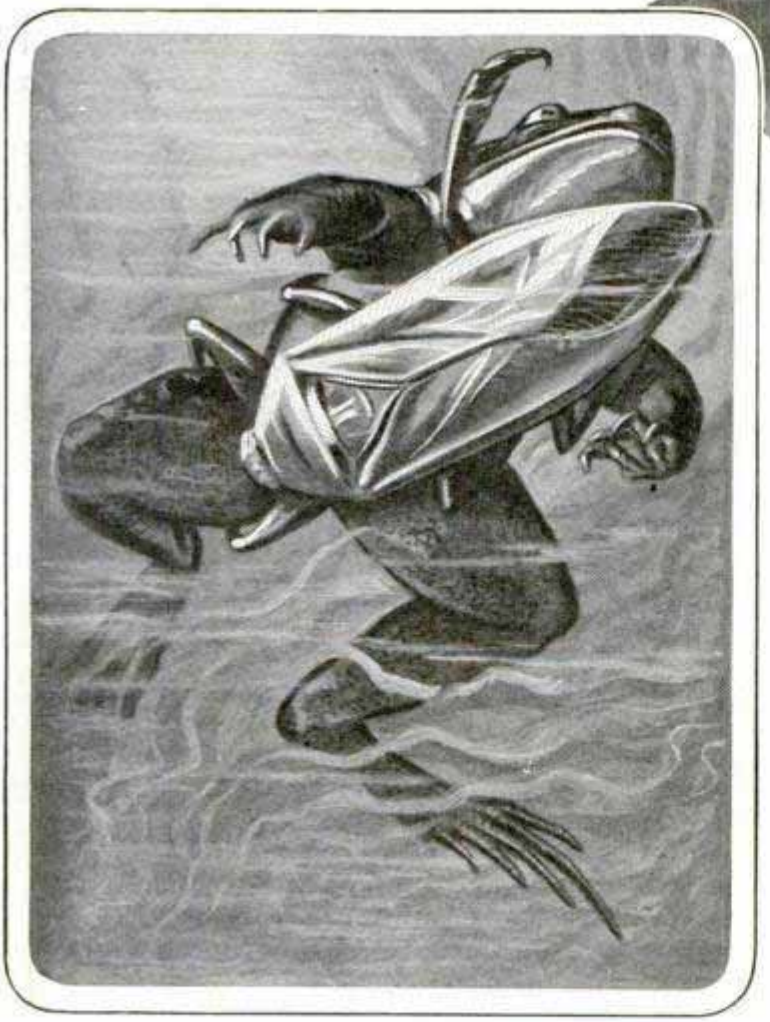
By RENE BACHE



AMONG the most ferocious of creatures of prey are numbered many insects.

In that class spiders are, of course, conspicuous. But the huge spiders called tarantulas are in turn preyed upon by an insect known in our own southwest as the tarantula killer.

The tarantulas are trapdoor spiders. They spin no webs, relying upon their strength and agility for the capture of victims, the latter including an occasional mouse or ground-nesting bird, and their homes are burrows, usually in the side of a clay bank, lined with silk. The door of the tarantula house is set on a strong silken spring, and shuts with a snap when the owner has entered or comes out. At home, the tarantula is perfectly safe, the entrance of its burrow being so artfully camouflaged as to escape even scrutinizing observation. But on its walks abroad, the giant spider is always in danger of attack by the killer, which is a species of wasp.

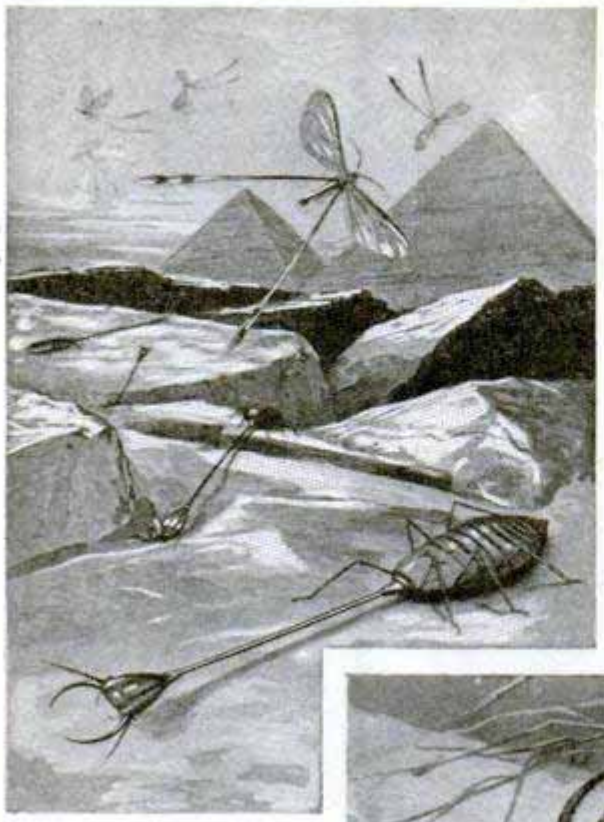


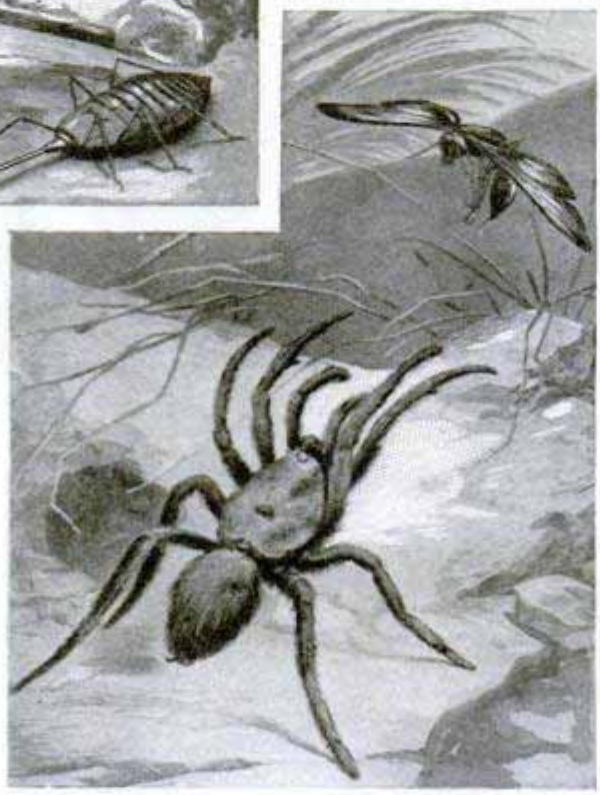
Giant Water Bug Attacking a Frog, and, Above, Two Collectors Coming down the Mountain with Sacks Filled with Ladybugs Which Destroy the Parasites of Cantaloupe Vines

Against the wasp it has no adequate means of defense. Constantly turning this way and that to face the enemy, it is inevitably taken sooner or later, in flank or rear, stabbed with the killer's envenomed lance and paralyzed.

The duel invariably ends with the death or total disablement of the tarantula, in whose body the killer lays its eggs, in order that the baby wasps, when they are hatched, shall have food to eat.

Among the most famous of insects of prey are the driver ants of tropical Africa. They have no permanent homes, but are continually





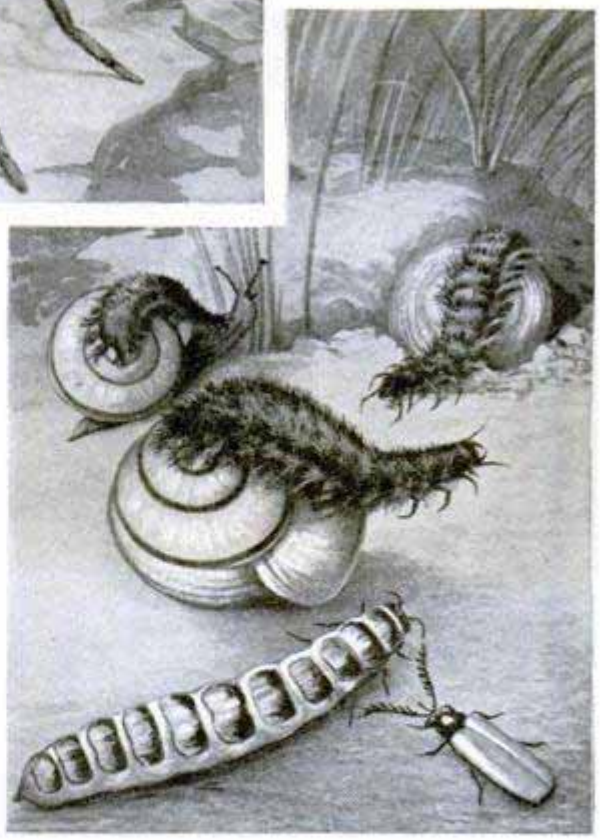
on the march in armies numbering countless millions, which are systematically organized and seemingly disciplined. All living creatures flee before them, including elephants and other beasts of the jungle. Any human being who did not do the same, would be quickly destroyed, his skeleton picked clean. Monster snakes found gorged and torpid are devoured.

Yet there is one exception. These fierce ants are themselves followed and preyed upon by an insect called the Bengalia fly, a trifle larger than the common bluebottle. Being always on the march, the ants are obliged to carry with them the cocoons containing their chrysalides. The flies, darting overhead, grab the chrysalides, tearing them from the jaws of the nurse workers, and bear them away for their own food.

One of the most remarkable of old-world insects is the Drilus beetle, whose grubs attack and devour snails. The adult male is, so to speak, just a regular beetle, but the female, much larger in size, never gets beyond the status of a loathly worm. The grubs, very hairy, many-clawed and with powerful jaws, have a most uninviting appearance.

In Java and other islands of the Malay archipelago there is a kind of mantis which imitates a beautiful flower. Perched in the center of a flower cluster, it appears to be part of the latter. But woe to the butterfly or other unsuspecting insect that alights upon the cluster, for it will be instantly grabbed and eaten. On the ground, the mantis exactly resembles a fallen blossom of an orchid.

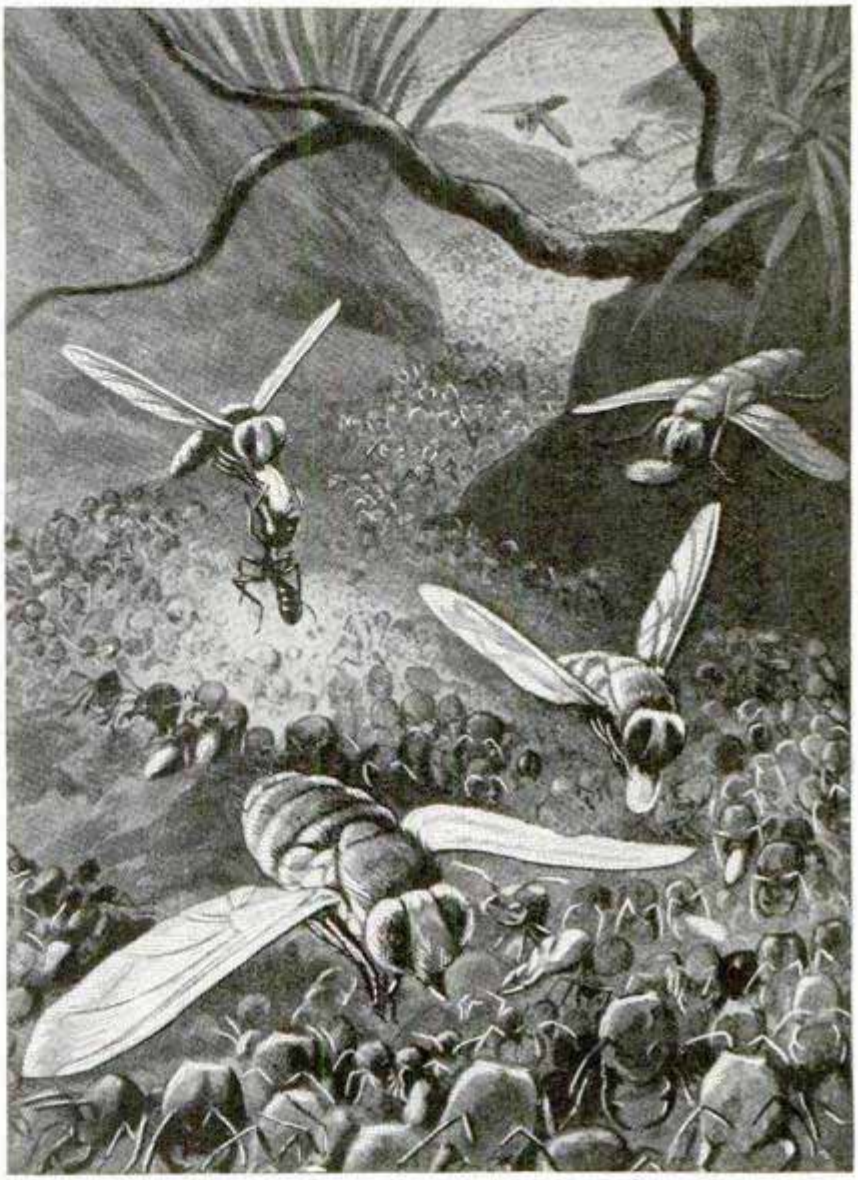
"Ladybird, ladybird, fly away home!" What other insect is so enshrined in folklore? How innocent is that pretty little beetle — seemingly. Yet, in reality, it is a fierce creature of prey, its principal food being the



Long-Necked Ant Lion, Top; the Tarantula Killer, Center; and Three Hair-Snail Killers, Offspring of the Pair of Beetles in the Foreground

green bugs, or plant lice, which do so much damage to crops and garden plants. For that reason it is rated a very beneficial insect and a friend of the farmer.

The Imperial valley in California is famous for its cantaloupes, but the fruit could hardly be grown there save for the help of ladybugs. In spring, men go up into the high sierras, where the little beetles hibernate in mossy places under the snow, usually near small streams, and dig them up. They are commonly to be found in clusters, hundreds of them bunched together. When thus collected, they are put through coarse wire sieves, to get rid of the debris mixed up with them, and are thereupon packed in sacks and carried down into the valley, sometimes on the backs of mules.



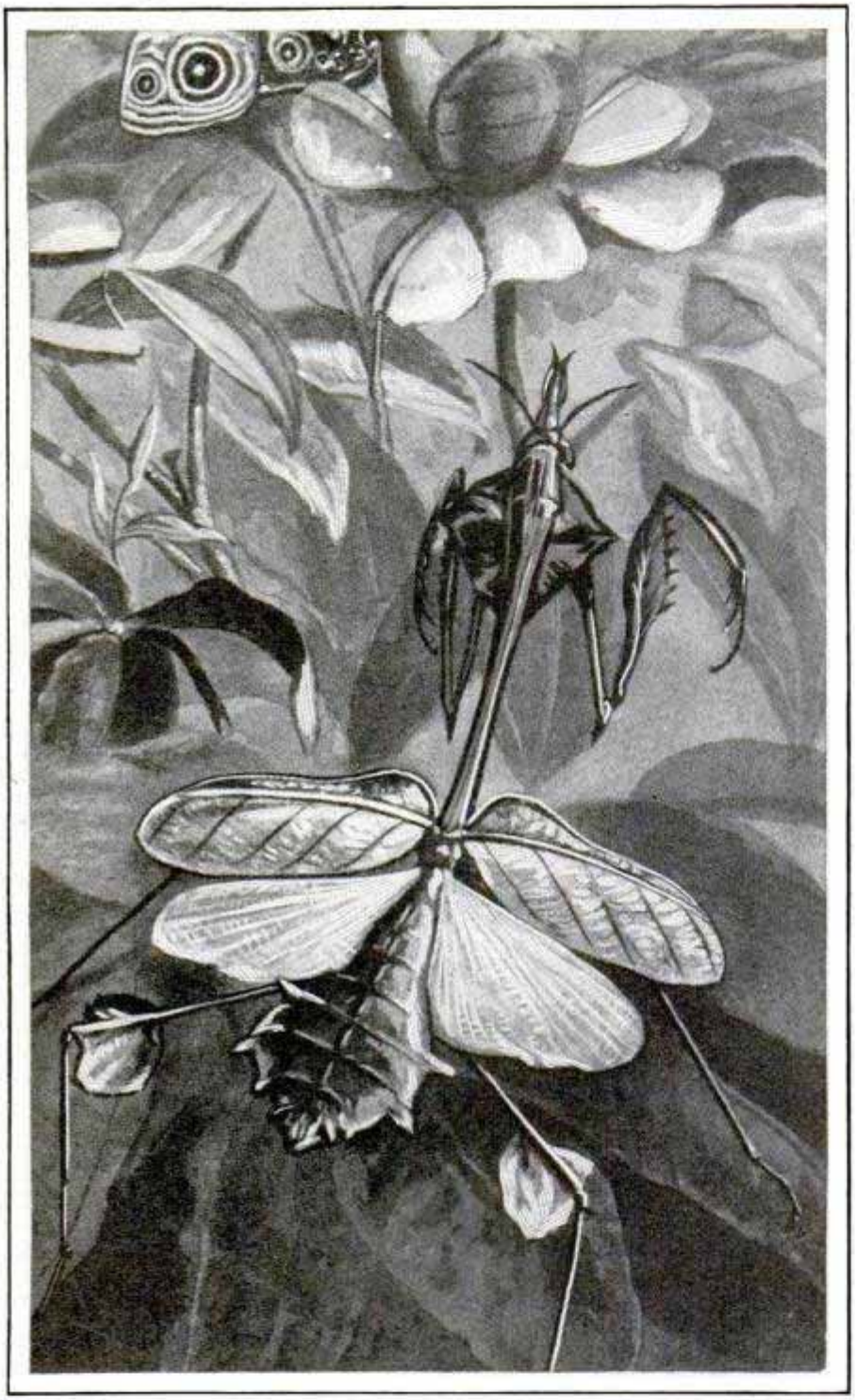
Bengalia Flies Stealing the Cocoons of Driver Ants; Warfare Is Constant and Ferocious among the Myriads of the Insect World

They are collected in this way literally by the ton, and are placed in cold storage, in order that they may stay asleep and inactive until they are wanted. When the green bugs have begun to appear on the cantaloupe vines, and before they have had a chance to multiply in armies, the ladybugs are sprinkled over the fields. With celerity they go after the green bugs, devouring them as fast as they are hatched, with the result that the melons grow and ripen beautifully.

The experimental use of ladybugs for this purpose was first attempted in the Imperial valley, but has since been extended to other parts of southern California. Shipments of the beetles are sent long distances, in boxes, so many thousands to a box, counted by a special measuring machine which delivers them to the containers through a hopper.

In Egypt there is an extraordinary insect called the long-necked ant lion. Its neck is considerably longer than its body, and its head is provided with two curved pincers somewhat resembling a pair of ice tongs, very strong and sharp. With this equipment the creature is able to reach far into crevices of rocks for prey. Eventually it undergoes an amazing transformation, putting on wings and adopting an aerial mode of life.

Most small boys are familiar with a particularly horrid-looking worm, some four inches or more in length, called a hellgramite, which is commonly found in stagnant ponds. Eventually it transforms into a giant fly, which is familiarly known as the electric-light bug. Formerly the species was supposed to be rather rare, but the introduction of electric arc lights,



Malaya, the Nightmare of the Insect World, Produces This Mantis, Here Seen Waiting for Its Prey to Come within Reach

which attract this fly in large numbers, dispelled that notion.

The fly in question is a vampire. Nocturnal of habit, it dives in the night into ponds and streams, attacking small fishes, tadpoles and frogs. Grasping the victim with its powerful legs, it sinks its beak into the flesh and sucks the blood. In some places the rearing of goldfish in ponds has been made almost impossible by the depredations of this insect monster.

The fact that for every insect and worm there is another tiger parasite somewhere, ready to prey on it if the two can be brought together, is being capitalized by the department of agriculture in combating insect pests. As most of the pests that menace the nation's food supplies have been innocently brought in from abroad, the search for their parasitic enemies extends all over the world. An experimental station in northern Ohio is busy growing an imported tiger insect from Europe preparatory to turning it loose on the European corn borer, in the fight for which congress has appropriated millions.

When the corn-borer menace started spreading westward after its introduction from abroad, probably in a shipment of foreign-grown broomcorn, the pest specialists of the government went to Europe to study the corn borer's habits and life on its native heath. They soon found that nature had developed a tiger parasite which lived on a corn-borer diet, so a quantity of parasites were rounded up and brought to the United States for propagation.

The list of insect wars started by the government is a long one. Vast armies, like those of the ladybugs, are marshalled each year and turned loose on some unsuspecting enemy of fruit, grain or vegetables.

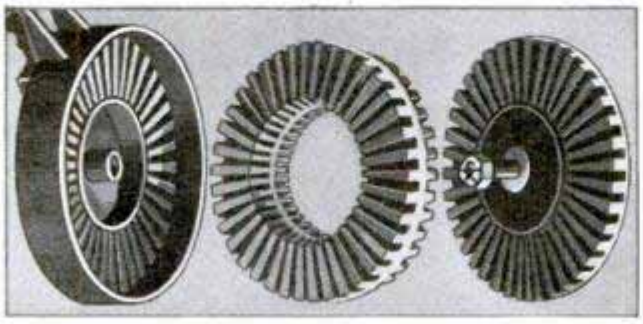
In the list of the insect kingdoms, though, there is none so perfectly organized or so well prepared for both defense and attack, as the ant. Many of the varieties maintain a standing army of soldiers, whose sole duty is fighting, just as the worker ants do the building and

gather the food supplies. When one of the huge colonies of driver ants starts across country, no animal is big enough to stay in its path. They swarm over everything and, when they have passed, the trail is licked clean of every living thing. Even streams do not turn them aside, for billions of them will form in a ball, often four feet or more in diameter, and launch themselves on the water, with the queen and young in the center and the workers and soldiers forming the outer layers.

In Mexico, and other lands where driver ants are common, beds must be mounted with each leg in a can containing kerosene to protect the occupant from invasion while he sleeps. If the moving ant army arrives in the daytime, the only safe refuge is the bed. Hans Heinz Ewers, the German naturalist, who has made a life study of ants, met his first driver army in Mexico, was chased to a chair, from there to the table top, from the table he managed to step into a washbowl of water, and when the ants started forming a living bridge across the water to reach him, he finally leaped to his bed and escaped.

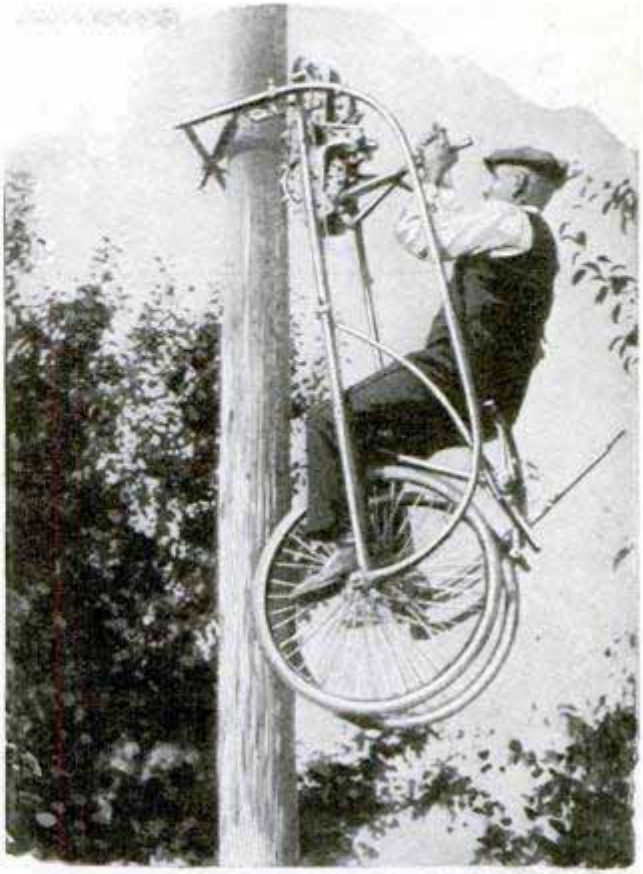
RUBBER DISK REPLACES SPRING FOR AUTOMOBILE

Successful tests with a rubber-disk arrangement, instead of the usual metal springs, have been conducted on automobiles in London. A car was driven forty miles an hour over a road of furrows and holes, a foot deep, without discomfort to the occupants, and the driver had no difficulty in keeping the automobile in the road, according to reports. The spring substitute consists of three parts for each wheel. A serrated rubber disk, resembling a gear wheel is fitted between two metal-toothed disks, one of which is secured to the frame and the other to the end of an arm on the axle. Bumps and jars are absorbed by the rubber disk, and the need of shock absorbers is eliminated. The disks have been tested for 20,000 miles, showing little wear.



Chief Members of the Disk Substitute for Auto Springs; the Center Part Is of Rubber

BICYCLE THAT CLIMBS POLES ALSO SERVES AS BOAT



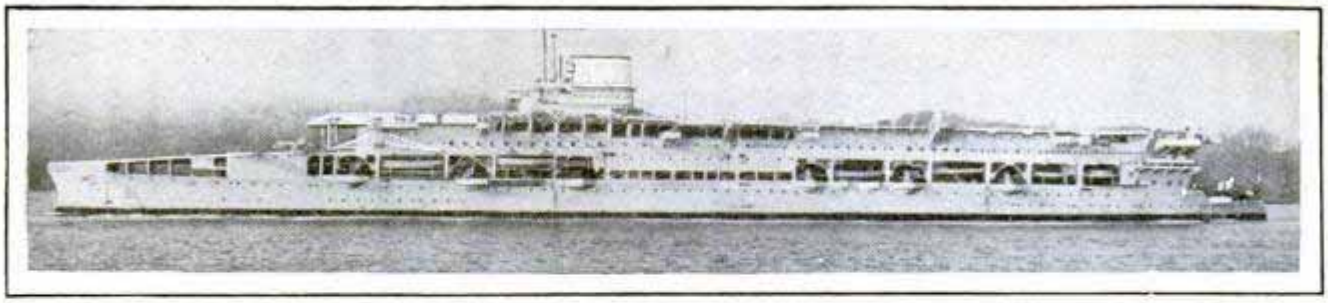
Climbing a Pole with the Odd Bicycle That Travels on Land or Water

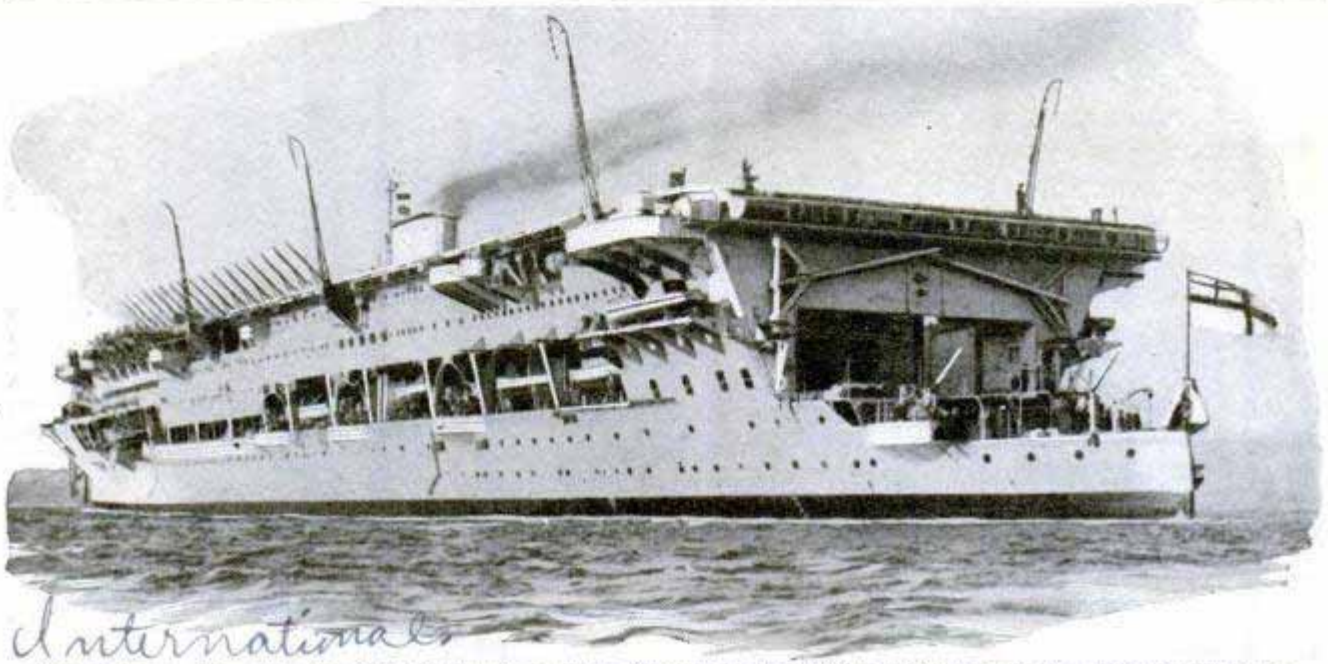
With slight alterations, a bicycle invented by an eastern man can be used as a climbing rig for scaling poles, or the frame may be converted into a boat by adjusting a strip of canvas and fastening it to posts. When not intended for these special uses, the outfit is pedaled in the usual way.

ETHER MASK HOLDS PERFUME FOR QUICKER SLEEP

By sprinkling perfume on ether masks used in operations, German surgeons are reported to have spared their patients some of the unpleasant effects usually attending the administering of anæsthetics. Sleep is induced more rapidly, it is said, and the suffocating cough is usually prevented due to the elimination of the nauseating odor of this narcotic.

BATTLESHIP IS TURNED INTO AIRPLANE CARRIER





Suggesting a New Use for Old Battleships; Two Views of the British "Courageous," a Former Warship, After It Had Been Converted into an Airplane Carrier

At an expense of more than $10,000,000, the British warship "Courageous" has been remodeled into an airplane carrier with landing decks and space for many planes. Six levels for repair shops and storage areas have been provided below the top deck. The craft recently underwent its first steam trial.

BUMPLESS SEATS FOR AUTOS CAN BE FOLDED UP

Reading a book while going over moderately rough roads can be done with ease and comfort, it is claimed, in a special automobile seat recently introduced in France. It is mounted on strong spiral springs to absorb the movement that normally jogs the body, and the back may be folded down or adjusted over a range of six inches. The seat may also be set forward or back and raised or lowered.

ORIGIN OF COMMON PHRASES

Few persons know that the motto of America, "E Pluribus Unum," was originally taken from a poem written by Virgil about 2,000 years ago, but such is the case, according to authority. A resident of the state of Maryland is said to have chosen the phrase "In God We Trust" for American coins in 1862. It was subsequently proposed by James Pollock, director of the Philadelphia mint, and, in 1864, was first placed on an issue of two-cent pieces. "He's a brick," is an everyday expression, but it is not generally known that it had its origin nearly 3,000 years ago, when Lycurgus, the great Spartan lawgiver, was asked if it would not be advisable to build a brick wall around Sparta and replied that the city already had a wall of men and every man was a brick.

PHOTO CELL TO GAUGE LIGHT AT NORTH POLE

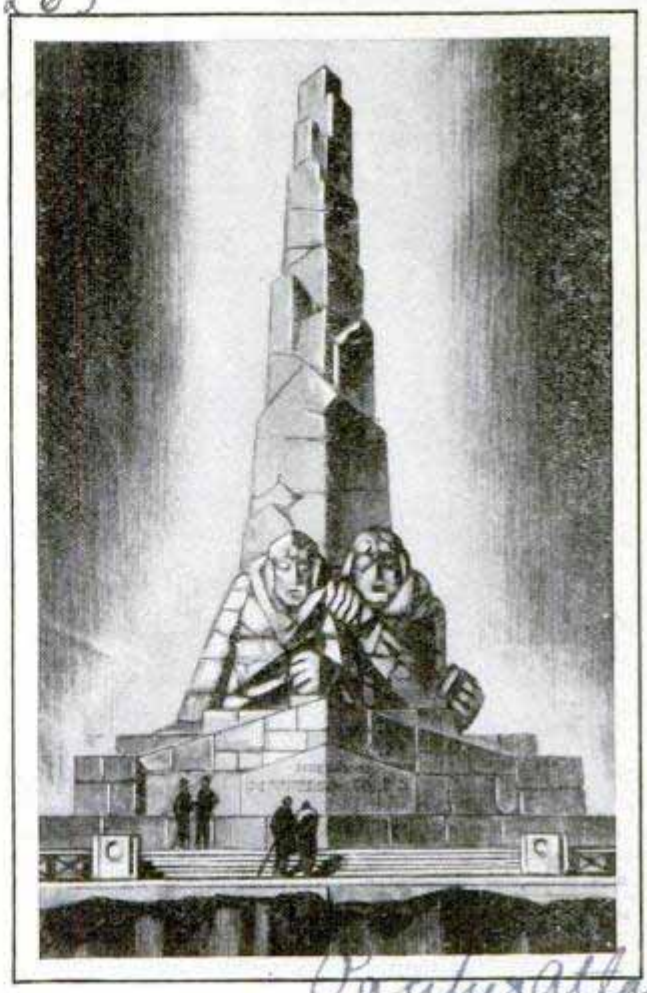
So sensitive that it will accurately measure the intensity of star light and will record sunlight faithfully, a giant photo-electric cell, developed by Dr. L. R. Koller in the laboratories of the General Electric company, will be used by General Nobile in his north-pole explorations this summer. The cell is said to be 100 times more sensitive than any of this type yet introduced, and is operated with a special recording meter, any variations in the intensity of daylight being registered on a roll of paper. The cell itself is a gas-filled bulb, seven inches in diameter, coated on the inside with a thin layer of cæsium, a metal extremely sensitive to light. This layer is the thickness of just one atom. How thin it is can be judged when it is known that billions upon billions of atoms could be confined within the head of an ordinary pin.

PLAYING CARDS FOR THE BLIND HAVE RAISED FIGURES

Bridge and other games may be enjoyed by blind persons with a set of cards that have raised figures, so that the different suits and values may be recognized by the sense of touch. In addition, a special rack is used to hold the cards so that they

Raised-Figure Playing Cards for the Blind; the Rack Provides a Convenient Way for Sorting Them

may be easily sorted and kept in convenient position for playing.



To Honor Nungesser and Coli; Sketch of Proposed Monument to Be Erected in France

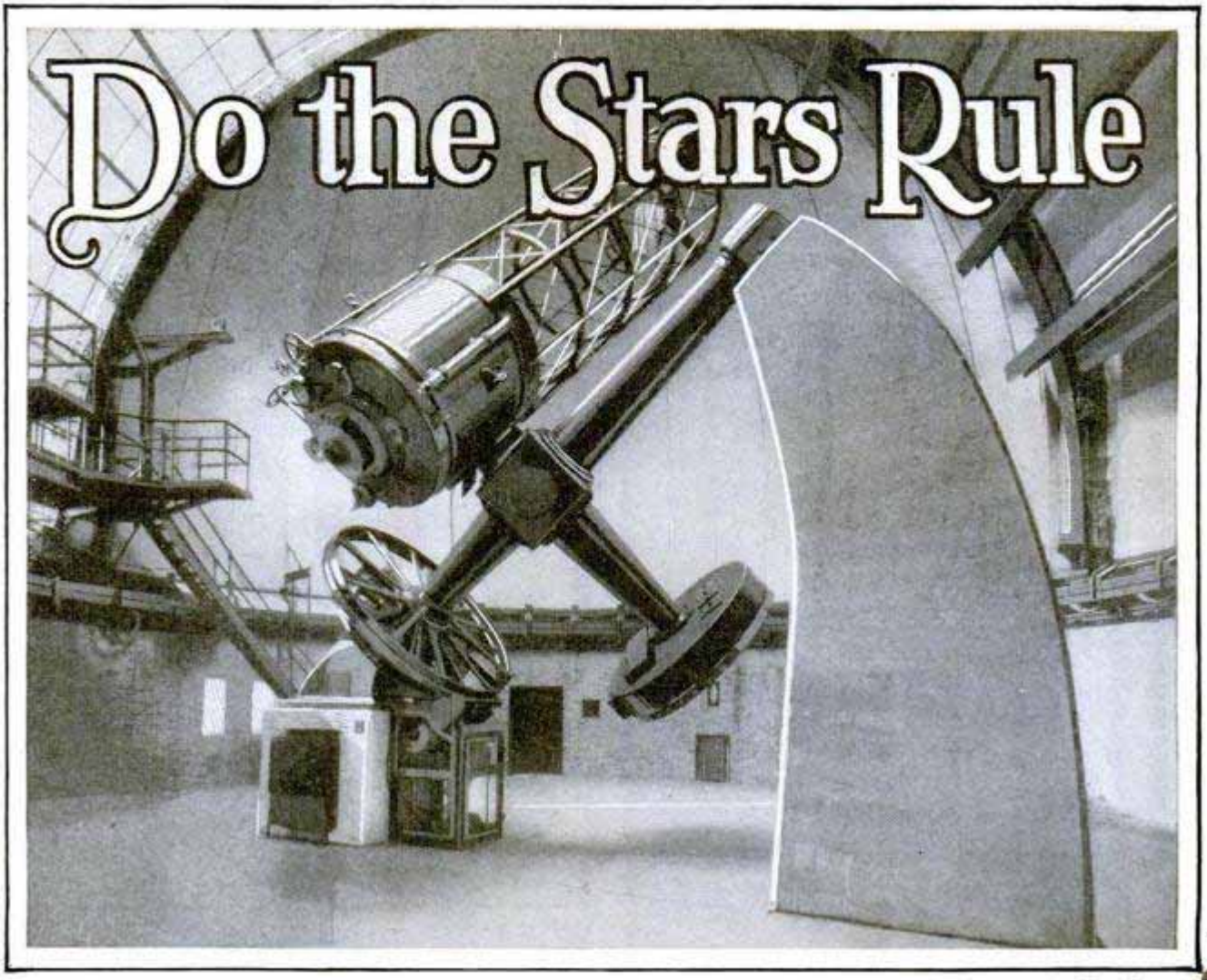
TRANSATLANTIC AIR MARTYRS TO BE HONORED

To honor the memory of Nungesser and Coli, who were lost in an attempt to fly from France across the Atlantic to America, a monument is to be erected on the cliffs at Etretat, not far north of LeHavre. It will be of unusual design, likenesses of the flyers forming the prominent part of the base.

GASKET TAPE FOR AUTOS SAVES TIME AND WORK

As a substitute for cork or fiber material, a roll of tape, one inch wide, has been introduced for fashioning gaskets on various parts of the automobile. It sticks of itself, eliminating the use of shellac or grease; gasoline or oil does not affect it, and the heat of the engine expands it. In use on oil pans, for instance, it is torn off and lapped at the corners, and the laps when screwed up, flatten out so there is no leak from the doubling of the tape. Bolts can be pushed through the fabric.

Do the Stars Rule



World's Third Largest Telescope, with a Sixty-One-Inch Mirror Cast by the Bureau of Standards, Has Been Built for Ohio Wesleyan as a Memorial to Prof. Hiram M. Perkins

By J. EARLE MILLER

A GHOSTLY, luminous visitor flashed out of the southern sky a few months ago, passed near the sun, and then dashed away to the south again, preceded, this time, by its tail.

Two hundred years ago, or even less, the dash across the sky of Skjellerup's comet—for that was the visitor's name—would have been accompanied by predictions of wars or the death of kings because, for many centuries, the arrival of a visible comet always brought forth dire prophecies of evil.

The perfection of the telescope robbed comets of their terror for the superstitious, but fears were roused again by predictions of what would happen if the earth should ever pass through the supposedly deadly gases of a comet's tail. Along came the spectroscope, and the gases were analyzed. Strange to relate, the idea that they might be of deadly type proved true, but, for the safety of the world, it was found the gases were so attenuated that there was less of them than would be found in the most nearly perfect vacuum ever created in the laboratory.

So comets have been robbed of all their terrors, but the old idea that the stars, and particularly the planets of our own solar system, in some way affect our lives and destinies, still persists. Astrology, once the favorite science of the Middle Ages, fell into disrepute about the time the telescope began unraveling the mystery of the universe, but in recent years it has shown a tendency of coming back.

While its advocates are fond of referring to star predictions as an exact science, no one has ever yet produced proof to support any of the claims made for it. Ask an astronomer what he thinks of astrology, and the answer, according to Dr. Edwin B. Frost, director of the famous

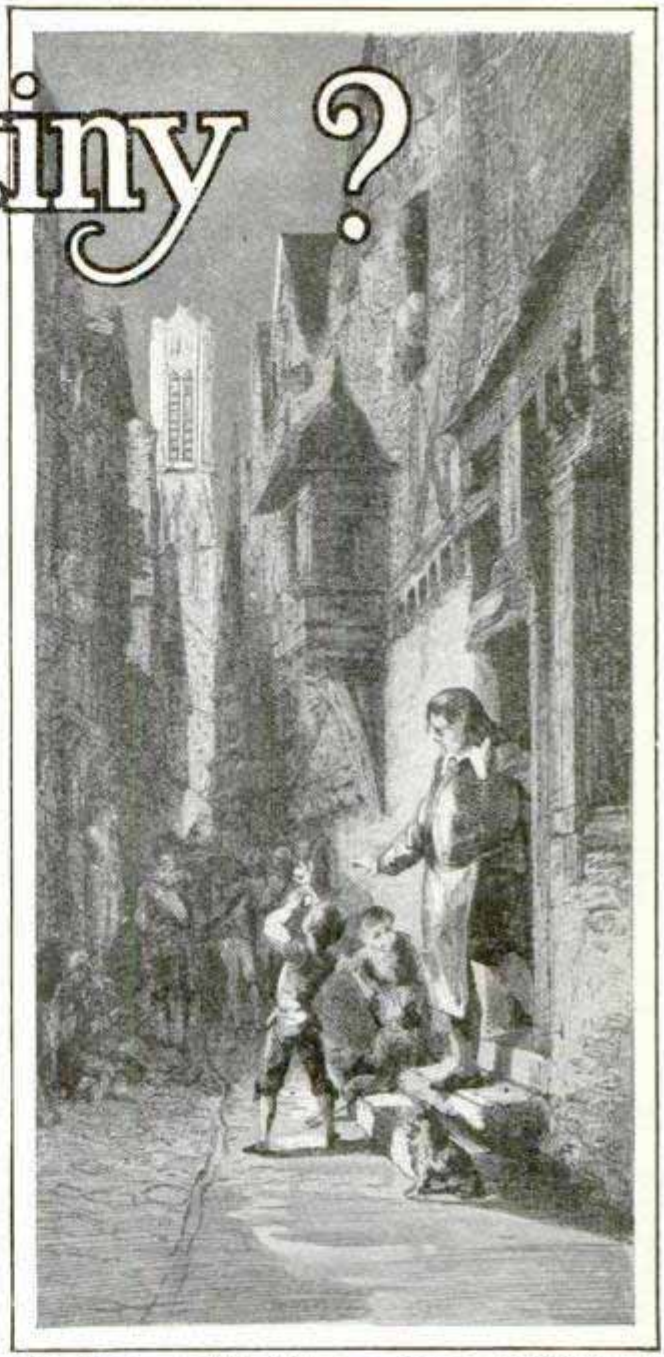
Our Destiny ?

Yerkes observatory, can be given in one word—contempt.

After granting that the moon, the sun and, possibly, the planets combine to exert a gravitational pull that produces the tides of the sea and, undoubtedly, similar flows in the earth's atmosphere, though the latter are too slight in their effects to be measured, there is no further evidence, according to astronomers, that the stars exert any influence on the earth or on human life.

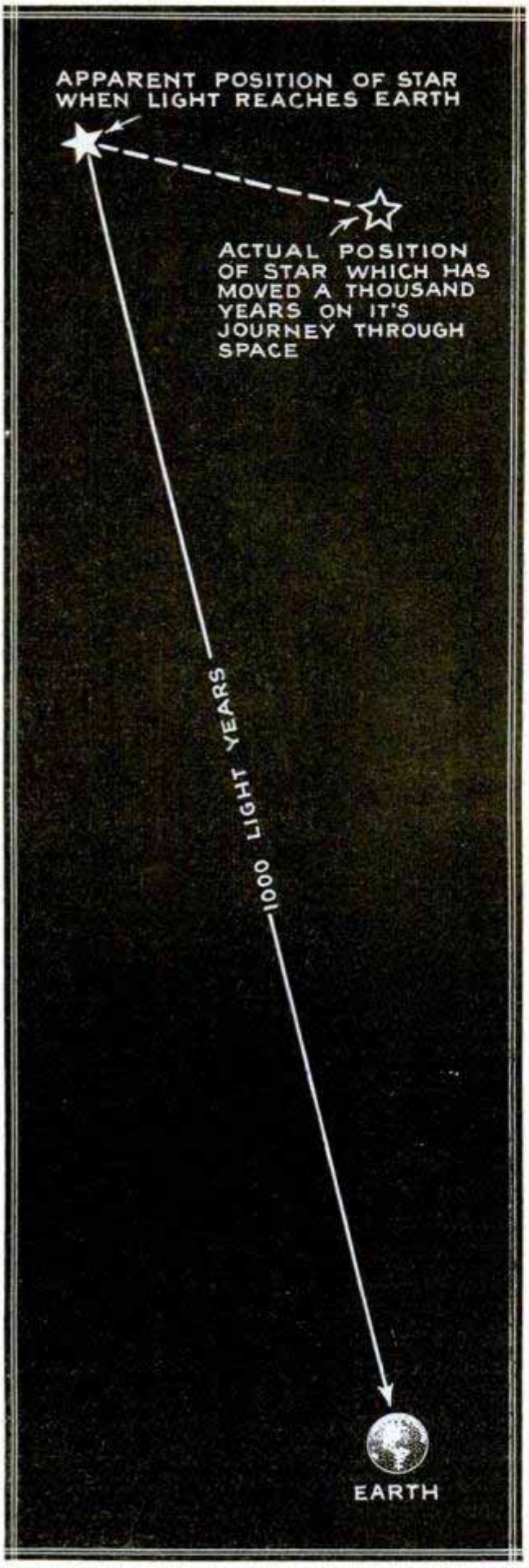
The department of agriculture has quashed all the old superstitions about planting crops in the dark of the moon or performing any other farm tasks at particular times during the moon's phases. Despite that fact, they keep bobbing up at regular intervals. Just recently an Englishman suggested that one's hair should be cut only at the time of a new moon because hair was growing best and was full of "sap" during the full moon. He cited, as his evidence, the alleged fact that mushrooms and plants grow best during the full moon, though science long ago proved there wasn't enough moonlight reaching the earth to have any effect on growing things.

Signs of the Zodiac, the Ancient Superstition Which Forms the Basis for All Astrology Today



The Discovery of the Telescope, from an Old Print; the Dutch, It Is Generally Agreed, Built the First Refracting Instruments of This Kind

The basic idea of astrology—that the position of the stars and planets at the moment of one's birth will dictate the course of one's entire life—has one fatal weakness, from the astronomer's point of view. For, if the astrologer is right and the stars in certain formations are to affect the life of a person born at that moment, then it must be some other person than the one whose horoscope is being cast, for the stars and planets were not in their apparent relationship at that moment, and never could be. If one's future is to be dictated by the position of some fairly close planet, Mercury for example, in relation to distant stars at the moment of birth, the apparent, visible relationship is



Astrologers Who Con the Position of Distant Stars in Casting Horoscopes Overlook the Fact the Stars Aren't Where They Are Seen

all wrong. If your astrologer casts your horoscope on the basis of Mercury's location, for example, in the zodiac house of some far away stars, here is what happens to upset his figures:

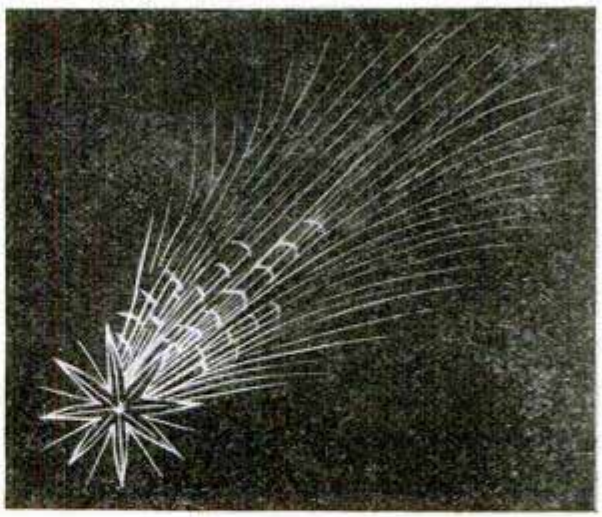
It took the light of Mercury, because of its nearness, only a few moments to reach the earth, so its apparent position at the time was virtually correct. But some of the stars may be a million or more light years away; in other words, the light received from them at that particular moment may have left them a million or more years ago, and, therefore, they, instead of being where they are seen, are a million years or more farther along in their journey through space. When they were where you see them, a million or more years ago, the planet probably wasn't in the same place, and even if it was, no astrologer claims that that could have affected your birth. And as they aren't there now, when the planet is, then the supposed stellar influence, if it comes from their relation to each other, must affect some other person, and not you.

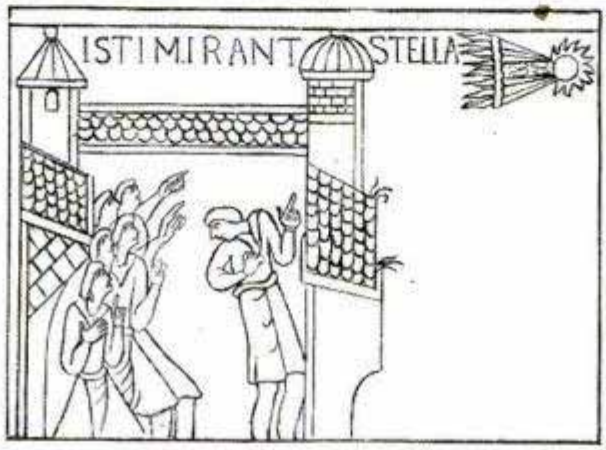
Astronomers do owe one debt to astrology, however, for it is out of the superstition and the groping for information in the past that modern astronomy has come, just as modern chemistry is the child of the alchemists who once sought to transmute base metals into gold. The two parted, though, when the astrologers kept on playing with superstitions, while the astronomers began to deal in facts.

Comets, more than any heavenly spectacle, were associated with superstition through the centuries, because, before the day of the telescope, the rare and splendid sight of a comet inspired awe. Nowadays, when any amateur owning a four, five or six-inch telescope, may be one of the dozen or so persons who yearly find new comets, they have lost their terrors.

The most famous comet of them all was seen by this generation when Halley's great find made its periodical return to the solar system of the earth in 1910, and furnished the rare spectacle of our planet passing through a comet's tail. Although the comet did not get a name until the early seventeen hundreds, old records have traced its periodical appearances back as far as 250 B. C., so it remains the oldest definitely identified visitor.

Around it there have grown up more superstitions, perhaps, than all the rest of the comets of history can boast, except the comet of 1680, which Halley also observed and wrote about. The 1680 visitor acquired fame when Halley, through a mistake in his calculations, announced it would return at intervals of about 575 years. An English minister, named Whiston, thereupon produced a book called "A New Theory of the Earth," in which, with the aid of the comet, he sought to explain the geological records of the book of Genesis. Working backward from 1680 and using Halley's figure of 575 years, the writer proved, to his own satisfaction at least, that nearly everything in the Bible, including Noah's flood, could be traced to this comet, and, figuring forward, he sought to demonstrate that the prophecies of Revelation, including the eventual destruction of the world, would be fulfilled through the same source.



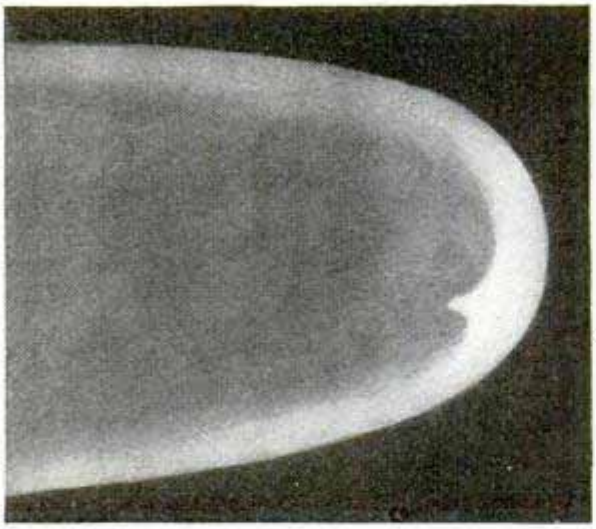


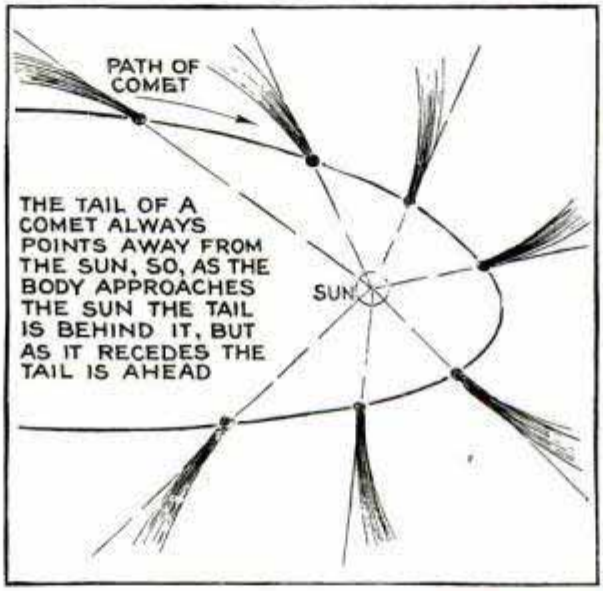
The World's Most Famous Comet on Three of Its Appearances; Above, Halley's Comet in 684 A. D., from a Drawing in the Nuremberg Chronicle; and, Center, the Same Comet in 1066 A. D., from the Bayeux Tapestry

Halley's Comet as Photographed at Yerkes Observatory on Its Latest Visit, May 4, 1910; a Striking Contrast to the Childish Representations of the Earlier Dates

Unfortunately for the sale of his book, it was later found that Halley was in error, and instead of a period of 575 years, the comet of 1680 will not be due to return for 15,684 years, so, like the astrologer's horoscope, it must have been some other comet or some other world that was involved. The Halley comet, which appeared two years later, in 1682, was first discovered at that time by an observer at the Royal observatory, but when Halley undertook to calculate its orbit, and made his famous prediction that it would return in about seventy-five and a half years—a prediction that was fulfilled a few years after his death—his name became attached to the visitor.

His prediction was based partly on his calculation of the comet's orbit, and partly on the fact that this path was strikingly similar to that of the comets seen in the years 1456, 1531 and 1607. When 1758 rolled around, all the astronomers in the world were watching for the return of the comet. In the meantime, however, the figures had been revised, when, after





The Last Visible Comet, Skjellerup's Find, Which Flashed Up Out of the Southern Sky Last Winter; at Right, Diagram Showing How the Tail of a Comet Always Points Away from the Sun

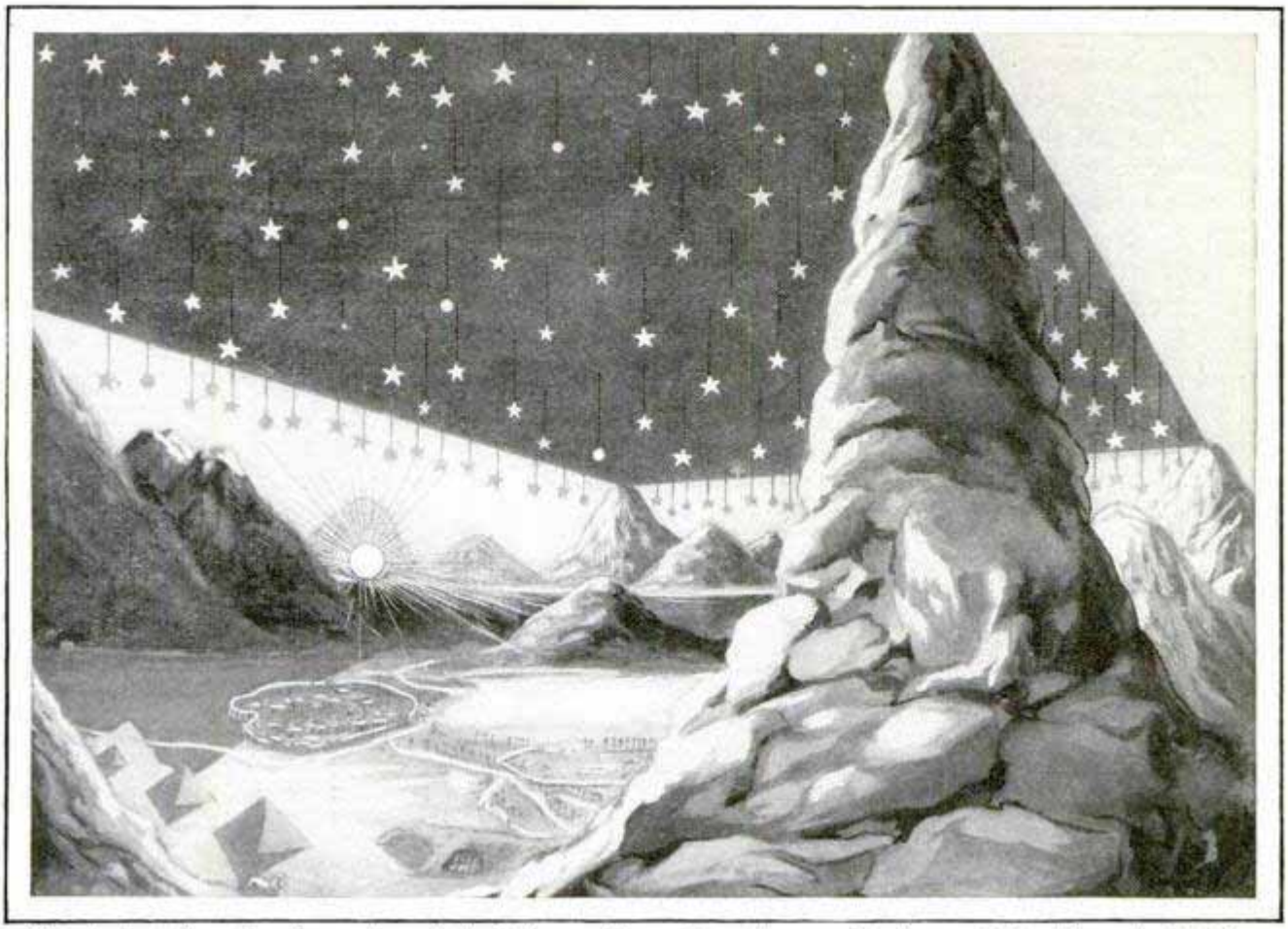
six months of steady figuring, it was found the attraction of Jupiter and Saturn, each time the comet had passed near them during the previous 150 years, was sufficient to retard it about twenty months, and fixed April 13, 1759, as the date of its perihelion passage, when it would reach the nearest point to the sun and again start the long journey out into space beyond telescopic range.

On Christmas night, 1758, a Bavarian farmer and amateur astronomer, saw the comet, and on March 12, 1759, just a month and a day inside the calculations, it passed perihelion, and Halley's theory had proved itself.

In the long history of the Halley comet, it has been associated in superstition with the death of the Emperor Augustus, as a result of its appearance in 12 B. C., with the destruction of Jerusalem by the Emperor Titus, because it appeared in 66 A. D., shortly before the Jewish-Roman war; with the Norman conquest of England, when it appeared in 1066, and with many other famous events. In the year 837, the Chinese astronomer Ma-tuan-liu wrote a fine description of the Halley comet, with minute observations covering several weeks. The Chinese were among the earliest observers of the heavens, and the Chinese annals, from the year 611 B. C. down to 1640 A. D., are filled with comet observations. In the western world one of the oldest comet reports on record is that written by Aristotle to describe one he saw in 371 B. C., when he was but thirteen years old. Pliny tells, however, of a heavenly visitor which was associated by superstition with the battle of Salamis when it appeared in 480 B. C., but whether this was a comet or not, is in doubt.

The word comet itself originated in the Greek language from a word meaning hair, as the Greeks believed comets to be bodies with hairlike streamers. Later the name of the appendage was changed to tail, but this is really a misnomer, for the tail follows the comet

Brooks' Comet as It Appeared at Yerkes Observatory, on Oct. 23, 1911, When the Tail Had Taken the Form of a Number of Beautifully Delicate Streamers



The Ancient Egyptian Conception of the Universe Was a Vast Canopy, Resting on Lofty Mountain Heights and Supporting the Stars, Hung from the Heavens like Chandeliers

at times, and at others precedes it. The reason is that the tail is always on the side of the comet opposite to the sun.

The comet of 1680, which Halley erroneously estimated as a 575-year visitor, would, on that basis, have been the one which appeared just after Julius Cæsar's murder, but, as it was later found the one seen by Halley had never before been seen within recorded history, the visitor that cast such awe over the Romans must have been another comet.

A fine comet, visible to the naked eye, appeared in 1769, shortly before the birth of Napoleon, and proved to have an orbit that would bring it back again in 2,000 years. Napoleon's life was associated by the superstitious with several comets. There was one that reached its perihelion the night the burning of Moscow forced the French army into the retreat that eventually led the Little Corporal to exile on Elba, and another appeared in the sky while he was leading his troops on the march to Paris to found the short-lived second empire.

A comet in 1264 was associated with the battle of Lewes and another, in 1556, appeared about the time of the abdication of the Emperor Charles V and is associated also with the death of Pope Urban IV. It is possible that the two were the same one, on successive visits, but it failed to appear in 1858, when it would have been due again. Chinese records are basis for the belief, however, that the visitors of 1264 and 1556 were one comet, for the period then would check with a comet listed in the Chinese annals in 975, 683 and the year 104.

Comets that fail to return when expected, and, in fact, that never appear again, are not unknown. One found by Montaigne, at Limoges, in 1772, was observed later by Pons, in 1805; Biela, in Bohemia, in 1826, and by others in 1832. Its orbit was calculated at six and a half years. In 1839, it was not seen, but in 1845 it appeared, split in two parts. Both parts returned in 1852, and since then have not been seen again. Every November, however, the earth passes through the spot where the comet may have disappeared, and there is a fine shower of meteorites—

the familiar falling stars—probably the remains of the lost comet.

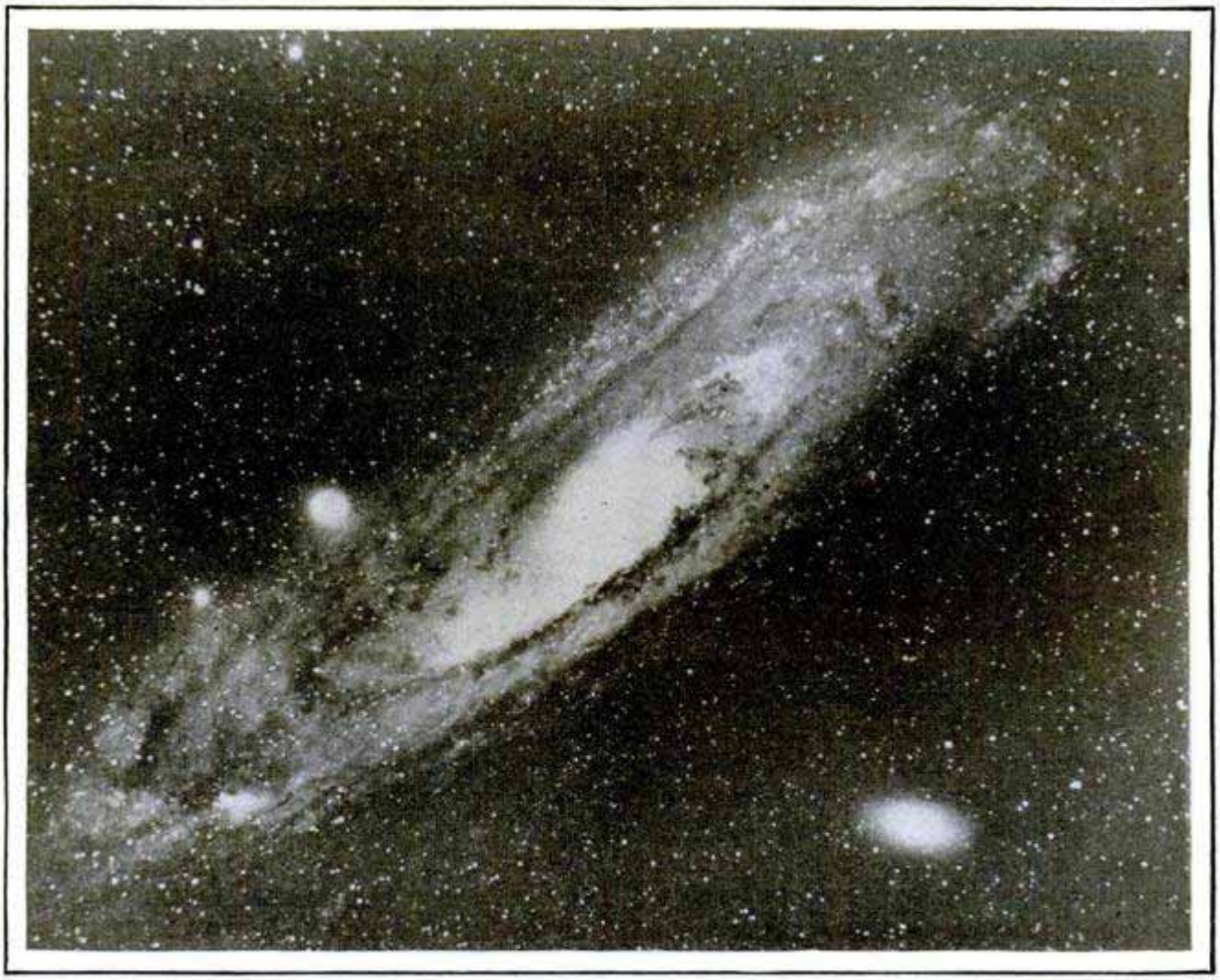
The earth passes through another meteor shower in the second week of August each year, and there is evidence that it is composed of the dust left by a comet found by Swift in 1862, for both occupy the same orbit.

What comets are remains to be discovered. Some observers have believed they shone with light within themselves, and others that they only reflect light. Stars seen through them shine with undiminished brilliancy, even when behind the comet's head, so the material of which they are composed must be almost transparent. Some have tails, some haven't, and others may have a multitude of them.

Comet finding is left almost exclusively to the amateur astronomers, as the bigger observatories are too busy with their regular work. The only requirements to hunt them are a moderate-priced telescope of about four, five or six inches' aperture, a good clear view to the east and west, so that watch can be kept for them just after sunset and just before sunrise, and, in the words of one astronomer, "plenty of time to waste." They are found best when near the sun, so sunrise and sunset are the favorite hunting times.

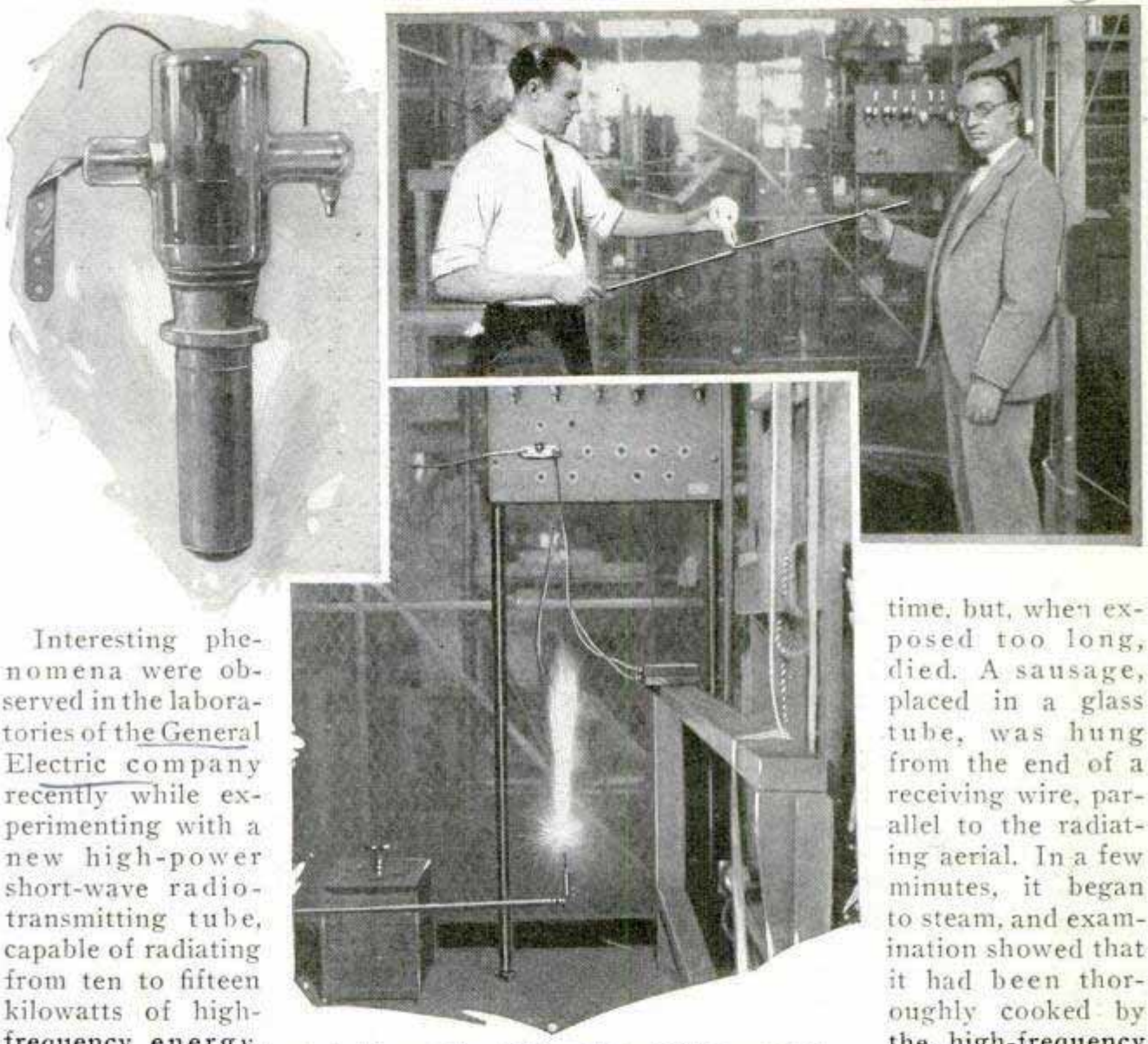
The late E. E. Barnard, of Yerkes observatory, found nineteen new ones during his lifetime. He won a $200 prize offered by a wealthy amateur astronomer for his first one, and, on the strength of that, invested the money as first payment on a home, then proceeded to find enough more to win prizes and complete the payments. The "comet house," as it was named by his friends, still stands at his old home, Nashville, Tenn.

Most of the comets found each year, and the number is frequently a dozen or more, are so faint as to be visible only in a telescope. Within any one century, it is estimated, there is an average of about five bright ones visible to the naked eye.



One of the Many Island Universes in Space, a Spiral Nebula Made Up of Millions of Suns So Far Away That Even the Most Powerful Telescopes Cannot Distinguish Individuals

POWER, LIGHT AND HEAT SENT OUT BY RADIO TUBE



Left, Transmitting Tube; Right, Lighting 250-Watt Lamp; Bottom, Standing Arc, Two Feet High

Interesting phenomena were observed in the laboratories of the General Electric company recently while experimenting with a new high-power short-wave radio-transmitting tube, capable of radiating from ten to fifteen kilowatts of high-frequency energy, about fifty times as much as has been possible with previous units of this kind. An incandescent lamp, pulled from its carton for the first time, lighted to full brilliancy without wires or sockets when exposed near the tube; a copper bar, lying on the floor, blistered the hand that picked it up, although the metal was cold; a neon tube suddenly glowed when merely touched by a spectator. Meters and other instruments, in adjacent rooms, ran wild and were twisted and broken so that accurate scientific work in the vicinity was impossible. Persons coming too close to the tube apparatus suddenly felt a warm glow like that induced by stimulants, but soon experienced increasing pain in their limbs and joints. Rats close to the radiating wire became greatly animated for a time, but, when exposed too long, died. A sausage, placed in a glass tube, was hung from the end of a receiving wire, parallel to the radiating aerial. In a few minutes, it began to steam, and examination showed that it had been thoroughly cooked by the high-frequency current. An apple was baked to the core, eggs were fried and cookies were baked. One of the most striking effects was the production of beautiful greenish-white arcs, a foot or more high, when the radiating aerial was touched with a metal-tipped pole. When the pole was removed, the arc remained, like a plume of fire, sputtering and sending out molten copper in all directions until blown out. Engineers declare that the tube involves nothing really new in principle, but its operation marks the first time that such high power and short wavelengths have been combined. "No one can safely predict or promise a utility for such new things," said Dr. W. R. Whitney, director of the research laboratory, "but it is clear that further experiments must be carried out."

Filling Cigar Lighter from Coin-in-Slot Station Which Reduces Waste

CIGAR-LIGHTER FILLING STAND RUN BY COIN IN SLOT

Drop a coin in a slot and a quantity of liquid, sufficient to fill a cigar lighter, pours out of a spout. This lighter-service station was recently introduced in Paris tobacco shops and became very popular.

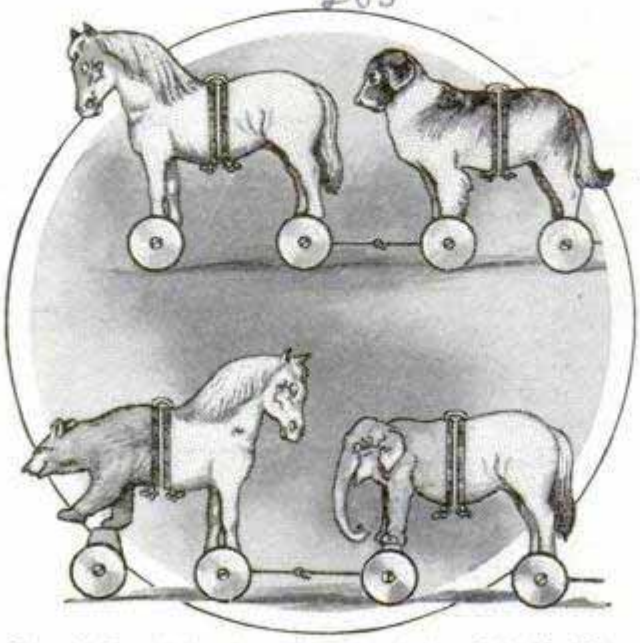
MYSTERY EXPLOSIONS IN EARTH LAID TO NATURAL GAS

Pockets of natural gas, forming under the earth in a district of northern Australia, are thought to have caused upheavals that occurred there recently. Geologists who examined the area noticed that the atmosphere, for miles around, was heavily loaded with the odor of petroleum and benzine. In some localities, the smell was so strong that it was feared an unprotected flame might cause an explosion. Apparently, pressure in the pockets had increased gradually until the overlying strata could no longer hold the gas, and it blew out.

HORNS ARE GROWN ON CATTLE IN LABORATORY TESTS

Horns on animals are developed from the skin and, possibly, the connective tissues, instead of from the skull, according to Prof. W. F. Dove of the University of Wisconsin, who has performed a number of interesting experiments with calves and goats. On these young animals, he was able to produce the solid horn of the deer, the sheathless horn of the giraffe, the casting and sheath renewal of the prong-horned antelope and the rhinoceros type of horn, which is composed almost entirely of a stiff substance without a bony core. The tests showed that the horn, when it begins to grow, can be taken from its normal position and transplanted to a foreign region or to another animal, where it will develop. The experiments have not indicated any method of controlling horn growth except by selective breeding. Even then, and under the most careful selection, calves occasionally will be born with horns though generations of their forebears were hornless. Dairy cattle without horns are preferred because they give considerably more milk than do the horned breeds. The horns use up lime and other materials that otherwise would go largely into the production of milk.

DOUBLE ANIMAL TOY CIRCUS HELPS EDUCATE CHILDREN



Jointed Toy Animals and Two of the Odd Combinations That May Be Formed from Them

Toy animals with interchangeable bodies have been devised by a western artist to add to children's amusement and also to aid them in becoming familiar with different specimens. Various novel combinations can be made, as the wooden bodies are quickly separated and locked again. The idea of the odd "zoo" was inspired by idle sketches the artist had drawn.

Shakespeare Road, Herne Hill
London. S.E. 24. England.
re ideal Homes Exhibition

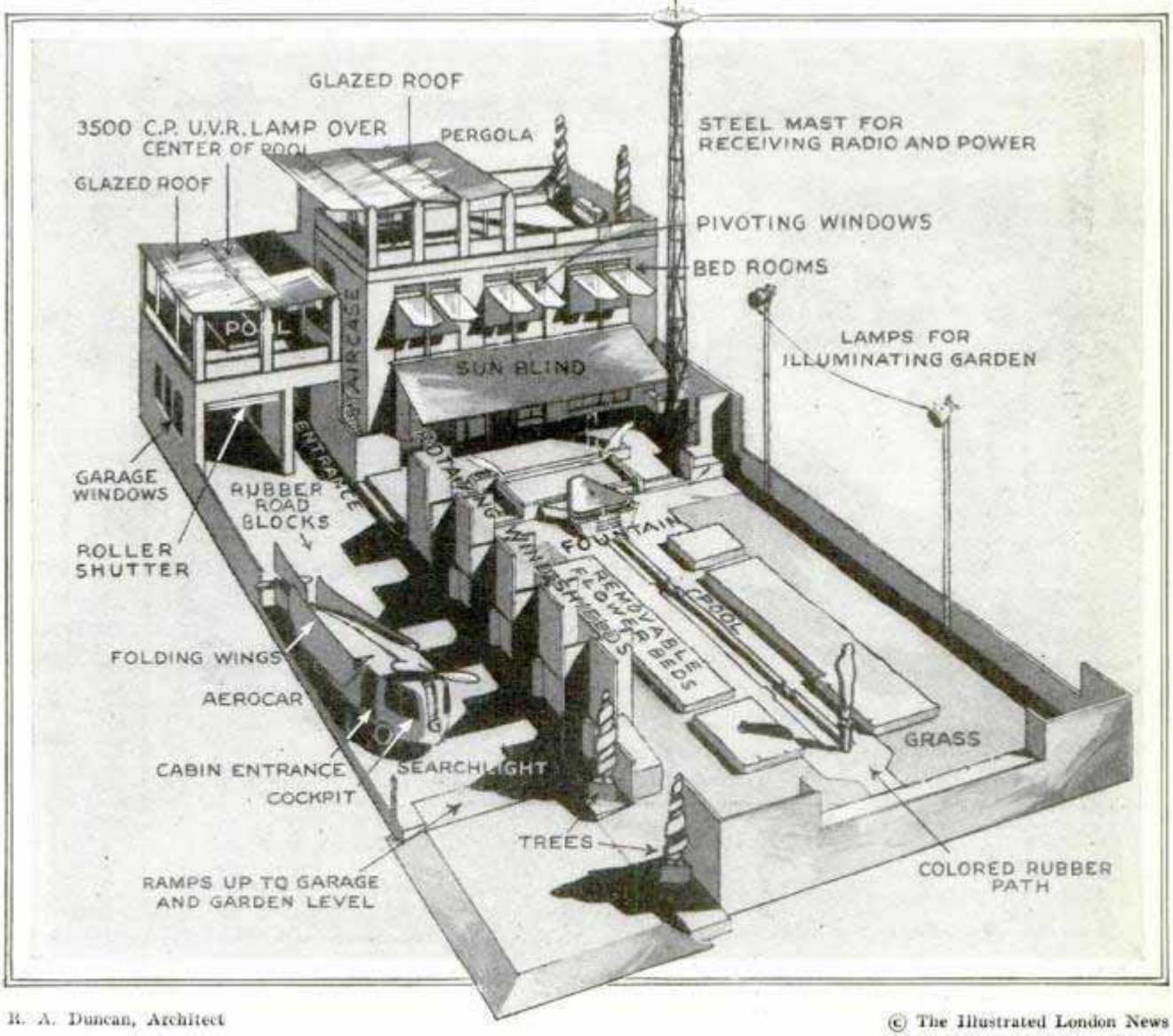
Home, Sweet Home of the Future

Television, Artificial Sunlight, Pneumatic Furniture, Metal Fittings and Unique Materials Combined in Architect's Vision

THE home of the future, as an architect envisages it seventy years from now—about the year 2000—was exhibited, full size, in London recently as a sunbeam house in a land of perpetual sunshine. "Vitaglass," to admit the sun's ultraviolet rays in fair weather, and artificial sunlight for cloudy days and night use, provided a permanent summer-day effect.

Convertible metal and pneumatic furniture, "bunk" rooms instead of bedrooms, laid out somewhat like steamer cabins, movable walls, metal furniture, a profusion of unusual electrical apparatus, a garage for a combination airplane-automobile, with folding wings, and, on the garage roof, a second-story swimming pool, gardens fitted with plants in movable containers so that new floral effects could be worked out at will, rubber-tile garden paths, wireless power and program reception masts, and banks of ultraviolet floodlights, were among the features.

The house, designed by R. A. Duncan, was severely plain, but its simplicity was relieved by futuristic plants and trees, formed of angular boards, painted in something resembling war-time camouflage designs, and a system of movable wooden wind screens along the garden wall to shut off or admit the breezes to any degree desired.



R. A. Duncan, Architect

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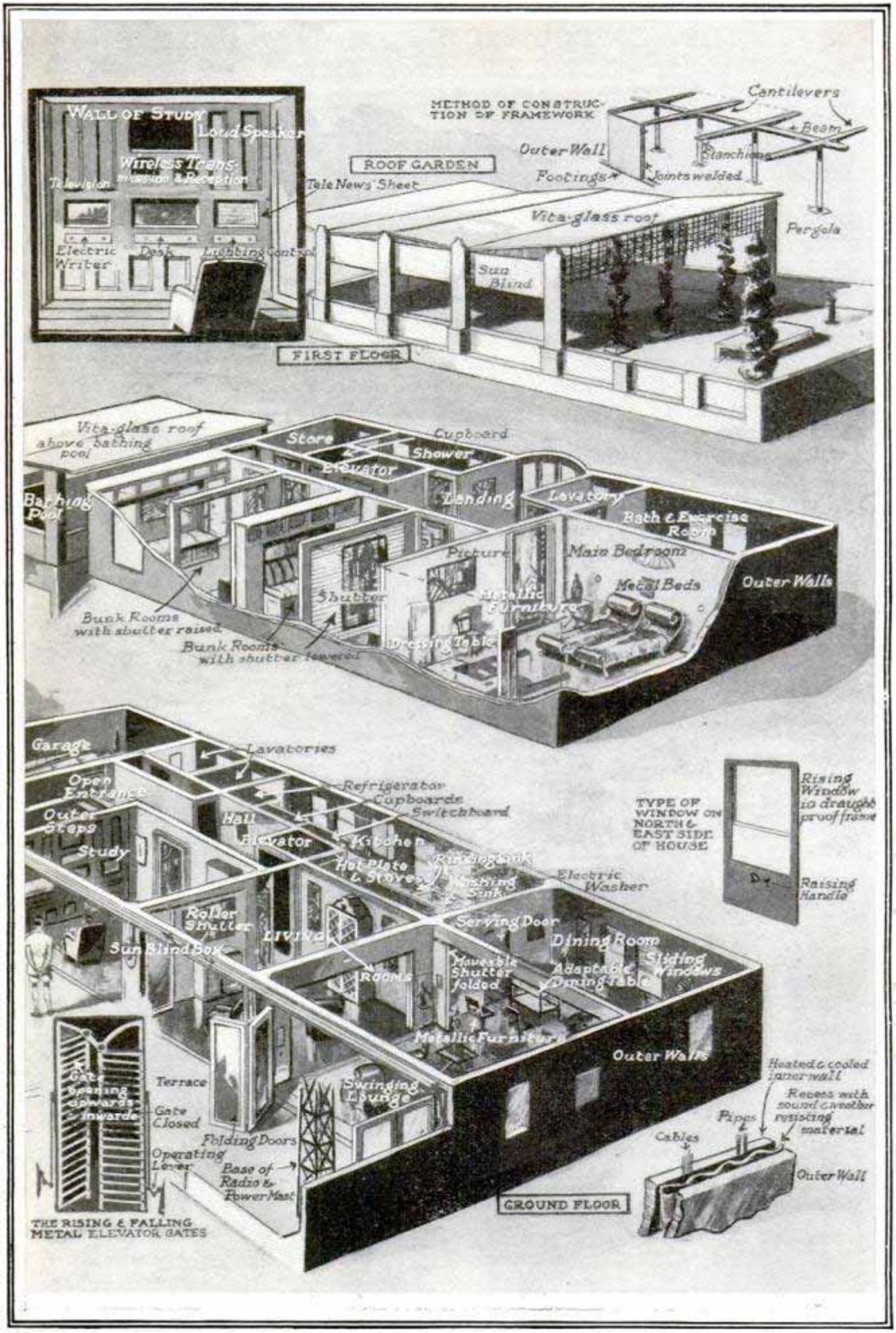

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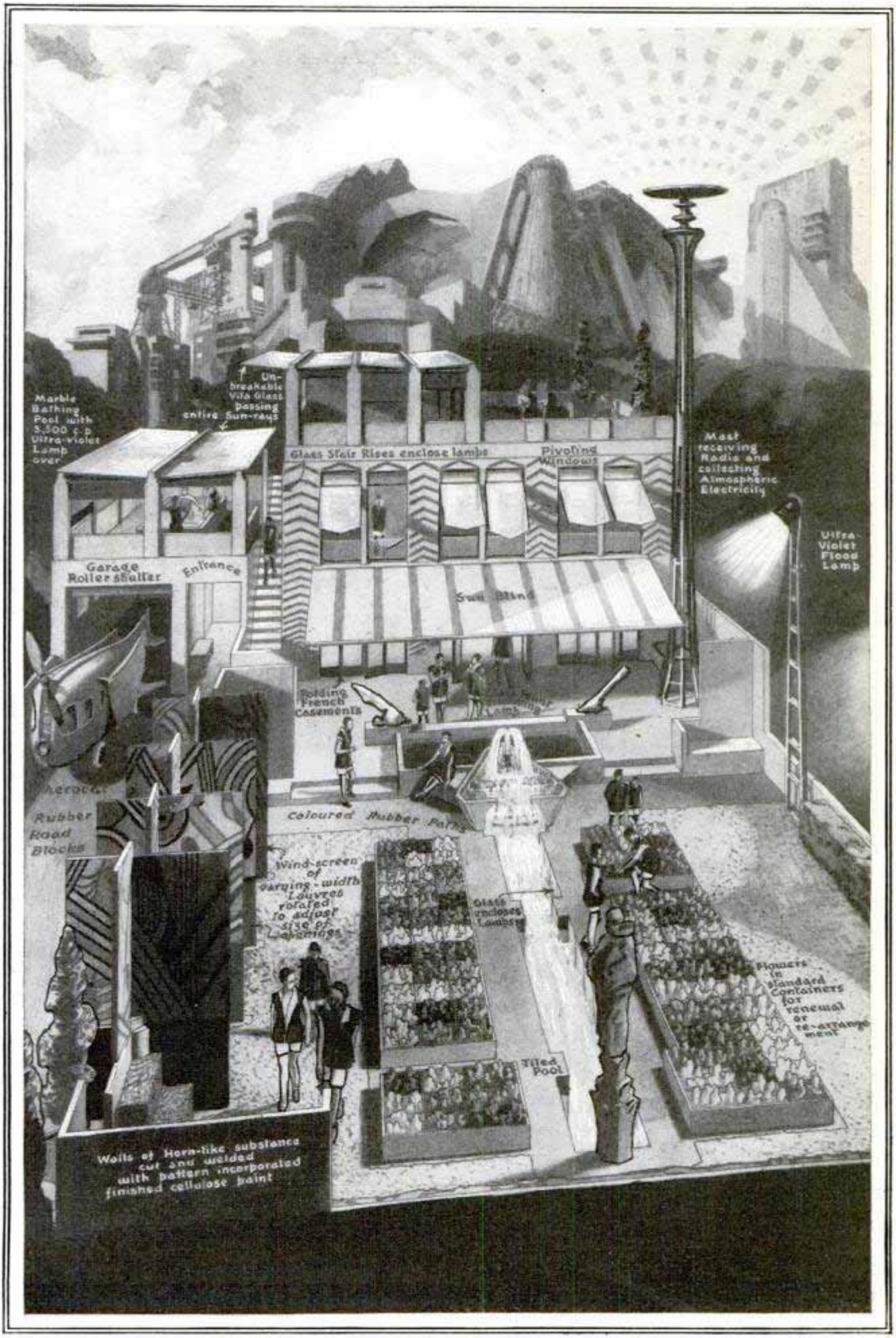


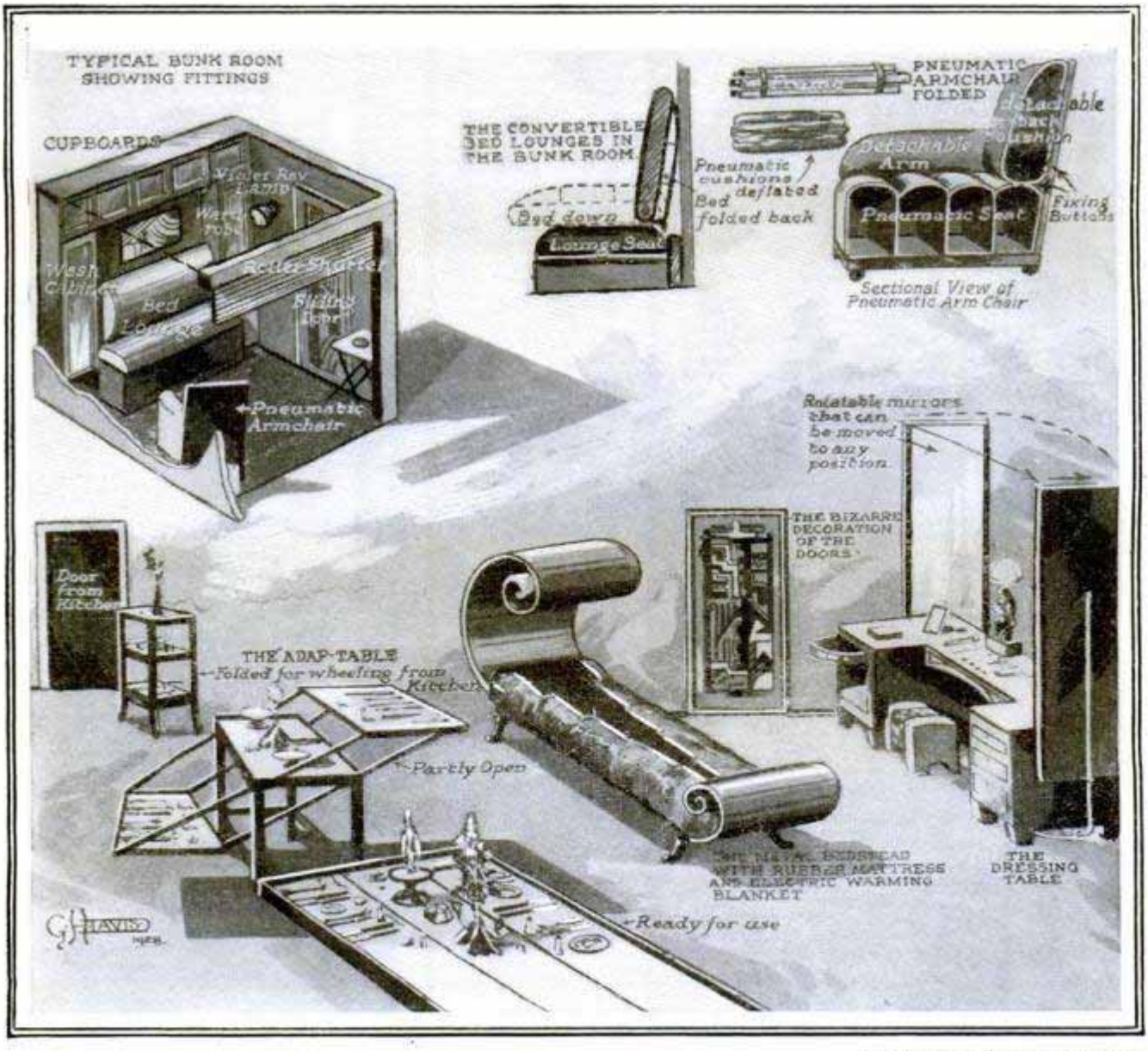
© S. W. Clatworthy

Electricity was predominant everywhere. A sunken garden pool and the fountain feeding it were illuminated by night from under-water lights in many colors. The queer metal beds with pneumatic mattresses were equipped with electric blankets for warmth. The study wall was lined on one side with built-in radio and loud speakers, a built-in television set to see the day's events and a built-in telenewspaper for visible radio projection of the day's news. An electric writer, to transmit by radio similar written messages, and an elaborate lighting-control panel also were included.

Pneumatic armchairs, with enormous inflated cushions built up in sections, were placed in the bed and living rooms. The chairs can be deflated and folded up into a small space when not needed.

Besides the main bedroom, with twin beds and metal furniture, there was a whole series of individual bunk rooms. The walls between them could be rolled up, like awnings, to throw two rooms together as one. Pivoting windows, sun blinds, a roof garden inclosed in vitaglass, and walls, specially insulated and provided with an inner surface that can be either heated or cooled, were other features. The wall was an unusual three-ply construction, an outer wall, an insulated space, which also contained all pipes and electric wires, and the inner wall, which took the place of radiators for winter heating, and provided a cooling system for summer.

Much of the furniture was unusual. The dining-room table was built in three sections, the two side parts being interconnected through a system of levers so that the table could be folded up as a three-story tea cart and wheeled in from



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the kitchen. The table is completely set, even to the centerpiece of flowers, in the kitchen, and then folded and wheeled into the dining room, passing through a standard-width door. Arrived in the dining room, it is unfolded and is ready for use.

Entire sides of rooms fronting on the garden and court yards folded back to admit air and sunlight in good weather. On the north and east sides of the house, which would be exposed to winter winds, automobile-type rising windows, moved by the usual automobile window handle, were fitted in wind-proof frames.

The airplane-automobile in the attached garage, while not a practical flying machine, was carefully built by an airplane designer as an example of the possible car of the future. The propeller, mounted in the nose of a streamlined, glass-inclosed car body, was mounted on a movable shaft which could be elevated ninety degrees, to place the propeller in a horizontal position above the car—for straight ascent as a helicopter.

The walls of the house were made of a hornlike substance, which is still in the experimental stage in a London laboratory. It is tough, impervious to moisture and capable of being cut and welded at high temperatures. The foundations and framework of the house were of stainless steel. The wall material can be colored or produced in any desired patterns. There was only one staircase—on the outside—rising between the main house wall and the attached garage and giving access to the flat roof. An automatic elevator was used inside, the elimination of the usual stairs in favor of an elevator shaft saving considerable space.

LINK IN CHAIN SERVES AS LOCK AND RESISTS TAMPERING

To afford greater protection, a chain lock now on the market is link-shaped and has no shackle to offer leverage for prying apart or breaking, as has the ordinary padlock. It is made of extremely hard steel, the key is self-ejecting so that it cannot stick in the lock, and the unit is rust-proof.

Inventor with the Trombone Flute Which Has Sliding Plunger as Substitute for Keys

FLUTE PLAYED LIKE TROMBONE GIVES WIDER RANGE

Sweeter music and greater simplicity in playing are the chief features claimed for a trombone an eastern inventor has devised. It saves learning the use of a number of keys and is said to have greater volume and a wider range.

EARTH STILL BEING CREATED MYSTERY RAYS SHOW

The process of creation is still going on, and the earth, instead of disintegrating, is passing through a cycle of evolution, in the opinion of Dr. Robert A. Millikan, noted scientist, who has explored the mysteries of the so-called cosmic rays. His research indicates that atoms which form oxygen, silicon, magnesium and iron, the elements that compose about ninety-five per cent of the meteorites and a similar proportion of the earth, are constantly being created in the heavens. The cosmic rays are believed to be a form of energy which escapes during the formation of these atoms. The rays, he declares, are "announcements sent through the ether of the birth of new elements."

PLAYING-CARD TILES PERMIT OUTDOOR GAMES

Close View of the Tile Cards and Holder, and Drawing to Show Them in Use

Durable tiles that cannot blow away or easily be defaced have been introduced as playing cards, permitting games out of doors in comfort. For bridge and other games, holders are provided, so that the tiles can be arranged in proper order and kept in position where other players cannot see them.

TOO MUCH KINDNESS KILLS FISH AQUARIUM EXPERT SAYS

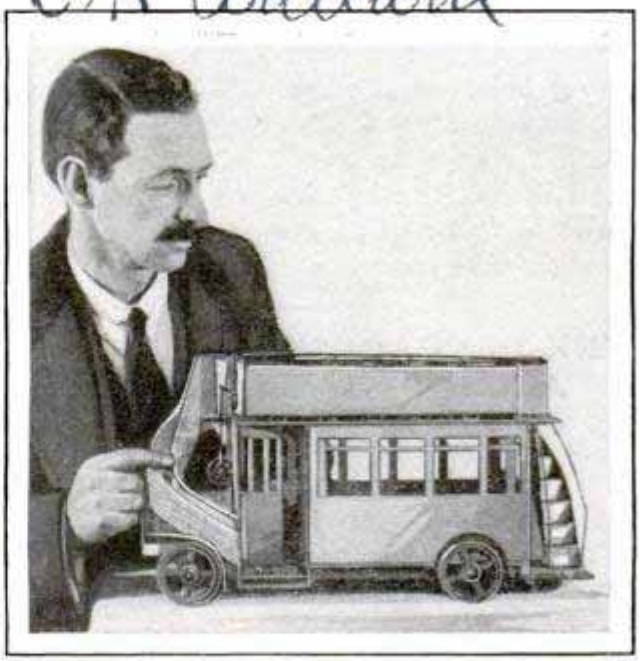
Overfeeding, changing the water too often and overcrowding the bowls, are among the common mistakes in caring for goldfish, an eastern aquarium authority declares. He says that many pet fish are killed by the kindness of their owners and urges that keepers remember that the pets have nervous systems, digestive apparatus and breathing organs which demand proper treatment in order to function effectively. If the water is changed suddenly or too cold fresh water placed in the bowl, the shock is likely to prove fatal. The water should never be heated artificially, as this drives out the oxygen, and only part of the water should be taken out of the bowl at a time. The time to change it is when the fish come to the top for air. A round bowl should be kept only half filled, as this increases the air space above the water. In order that the fish may thrive properly, they must have a balanced aquarium; that is, there must be sufficient water, air and oxygen for each.

STAGE AND AUDIENCE REVOLVE IN NOVEL GERMAN THEATER

For more rapid changes of scene, a German theater is being designed so that both the stage and the parquet floor can be turned. The latter swings around a full half circle so that the spectators can be placed quickly in front of an entirely different scene. The theater building is round and will contain many other novel improvements.

FRONT AND REAR EXIT AUTOBUS TO SPEED SERVICE

Both the upper and lower decks of a motorbus, devised by an Englishman, are served by an entrance at one end and an exit at the other, so there is less confusion in loading and getting off and considerable time is saved. The vehicle can be operated entirely by one man if necessary, as the exits from the top and from the interior of the bus are controlled by the driver,

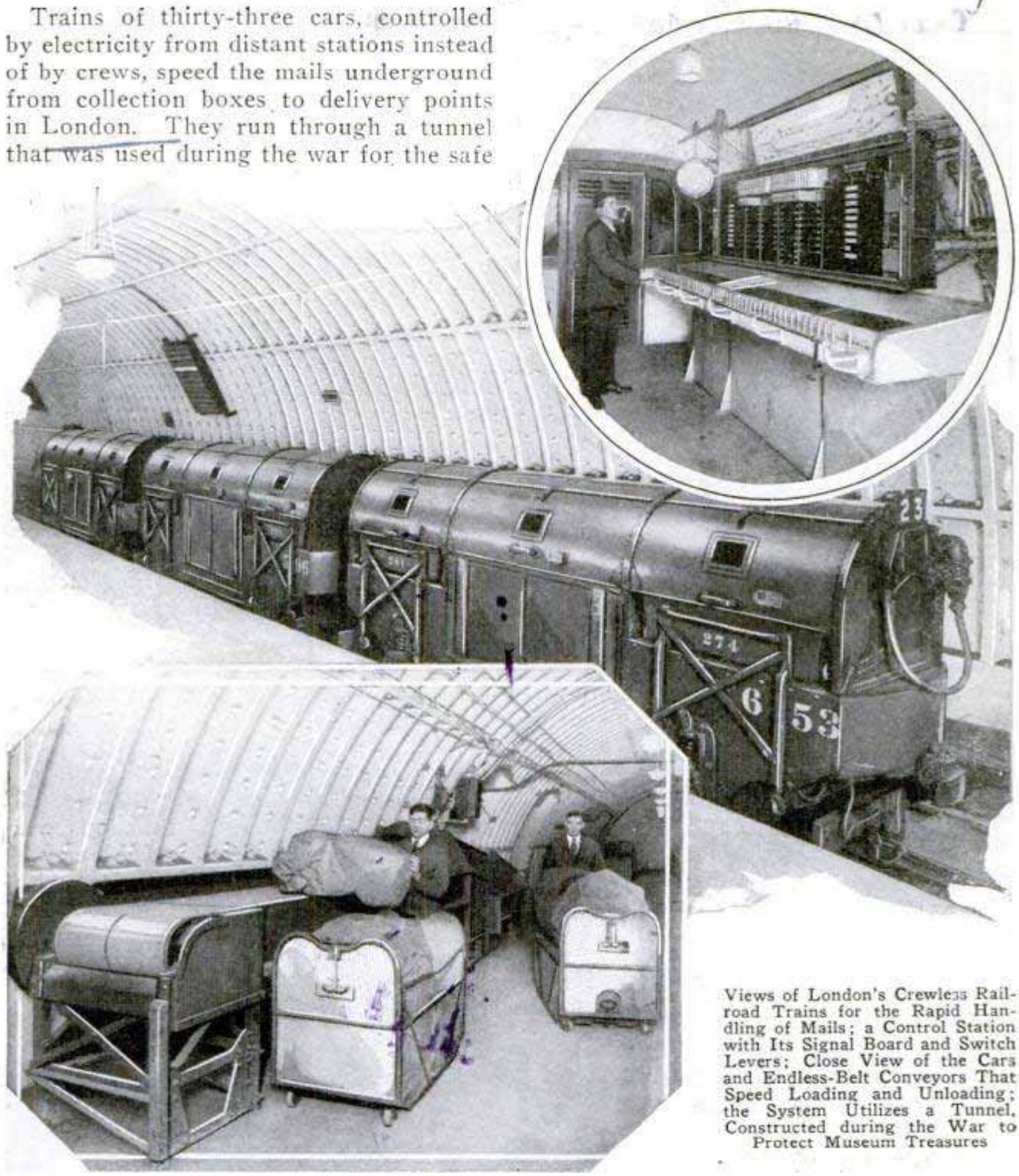


Inventor with Model of the Double-Entrance and Exit Autobus for Rapid Loading and Unloading

who thus can prevent anyone from leaving until he has paid his fare.

CREWLESS TRAINS SPEED MAIL IN LONDON TUNNEL

Trains of thirty-three cars, controlled by electricity from distant stations instead of by crews, speed the mails underground from collection boxes to delivery points in London. They run through a tunnel that was used during the war for the safe storage of treasures from the British Museum against air raids, as the excavation has been converted into part of the city's subway railroad. Approximately 23,000 bags of mail are carried daily, saving half an hour in the transit between the railroad stations and the post office. The line is eighty feet below the surface of the streets and is six and one-half miles long. The trains are controlled from dispatching "cabins" in the various subterranean stations. Automatic safety cut-outs prevent collisions, and indicators inform the operators where the trains are, when they leave the offices, and what track they will occupy on arrival. Speeds up to thirty-five miles an hour are developed. Nearly fourteen years were required to complete the underground system.



Views of London's Crewless Railroad Trains for the Rapid Handling of Mails; a Control Station with Its Signal Board and Switch Levers; Close View of the Cars and Endless-Belt Conveyors That Speed Loading and Unloading; the System Utilizes a Tunnel, Constructed during the War to Protect Museum Treasures

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¶ More than 2,000,000 separately distinguishable colors are possible for man's use.

FORTY BUNDLES TIED IN MINUTE WITH MACHINE

To Save the Busy Merchant Time and Trouble; the Package Tyer in Operation

Especially adapted to the needs of the grocer and butcher, a package-tying outfit is said to wrap as many as forty a minute. It is operated by hand and forms a compact, well-tied parcel.

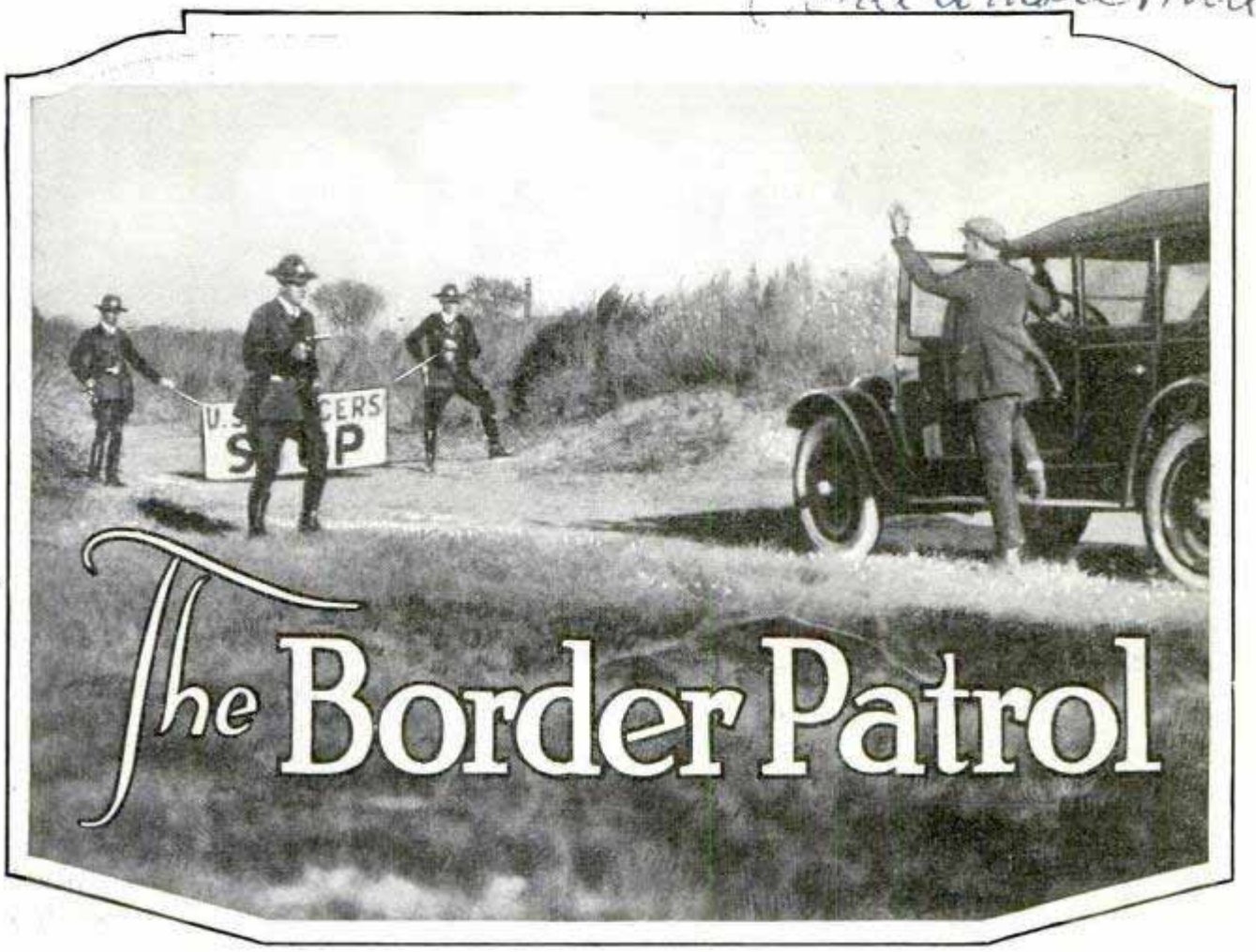
STUDY WHALES TO HELP DIVERS AVOID CAISSON DISEASE

How do whales remain submerged so long without injury? How do they adjust themselves to the tremendous pressures at great depths and how do they withstand the rapid change in pressure as they submerge or rise to the surface? Answers to these and other questions about whales and porpoises, are being sought by scientists in the belief that data gathered may be of aid in helping divers to avoid the disastrous effects of caisson disease, the malady that afflicts workers under high pressure while working in caissons, and other ailments. Like man, the whales are mammals and once lived on land. They have organs and tissues corresponding to those of the human system; hence, it is thought that knowledge as to the manner in which they have become adapted to a life in the deep sea, may be applied to the benefit of divers. The investigators are trying to learn how the whale disposes of the carbon dioxide given off by the body through the lungs during periods of long submergence, how the mechanism of breathing is operated, how blood pressure and pressure of the spinal fluid and muscular adjustments are made to meet the conditions below the surface of the sea. In connection with the experiments on porpoises, a number of brain specimens were taken which will later be studied in the laboratory.

GENERATOR MAKES HOT SPRAY TO SPEED CLEANING

For cutting the grease from motors, washing machinery of various kinds, removing paint, and a wide variety of similar tasks, a simple outfit that quickly generates a hot, high-pressure spray has been introduced. It operates somewhat on the principle of a flash boiler for the quick generation of steam and applies a hot cleaning solution under 100 pounds' pressure. The apparatus functions with almost any kind of cleaning fluid, may be operated by an unskilled attendant without danger and is easily mounted on a small truck for portability.

Cleaning Auto Parts with Hot Spray from Generating Unit Attached in Rear of Service Car; High Pressure Is Quickly Developed



POSTED along the American border, more than 700 alert patrol inspectors work day and night to stem the tide of lawless smugglers who devote themselves to running rum, narcotics and aliens into American territory. Twenty-four hours a day, every day in the year, these armed guardians of the frontier wage tireless warfare against unlawful invasion, matching wits with the shrewd, dangerous and unscrupulous outlaws who seek easy money by breaking international barriers.

Primarily organized to enforce the immigration laws, the border patrol encounters smugglers of all sorts and conditions, with contraband ranging from liquors to human beings and from diamonds to narcotics—everything that seems worth smuggling. The work of the patrol covers the Mexican and Canadian boundaries and strategic points on both seaboards, with heavy concentration in Florida because of the inviting nearness of West Indian ports.

The smugglers are many and persistent. The bootlegging of aliens has become a big business, second only to the bootlegging of alcoholic merchandise. In practical operation, the two activities travel together. Expediency and profit are the sole considerations. If money is lacking for the purchase of liquor consignments, the smugglers' alternative is a load of aliens—for human contraband requires no cash outlay; it pays in advance and finances the smugglers' activities on a generous scale, with further payment upon safe arrival at an American destination.

Smugglers are of two types, the well-organized syndicates and the freebooters of less orderly method. The syndicates are businesslike and competent, with fixed rates, while the freebooters gauge their charges by the customers' ability to pay. The unorganized smugglers are given to abandoning their cargoes at isolated spots, upon pretext of going for gasoline or food supplies, and they are not always careful to reach American territory before this takes place. Not infrequently the smuggler of this type drops all pretense of service and holds up his clients at the point of a gun, strips them of their funds and leaves them helplessly marooned.

Mexico is honeycombed with the activities of highly organized smuggling syndicates. European representatives route their alien clients to its seaports, where they are met by agents for transportation to Mexico City. At this point other agents forward them to Chihuahua for delivery to those who take them to Juarez, opposite the city of El Paso, or to some other point along the boundary line. At an appointed time, members of the organization lead a party of aliens to a crossing point where others take them in hand and pilot them to the American side. On arrival, still others are on hand to conduct the newcomers to rooming houses or to waiting automobiles, which take the immigrants to inland points beyond the reach of the border patrol and place them aboard trains for their ultimate destinations. In some cases, representatives of the syndicate accompany the strangers as far as St. Louis, Chicago or even New York City.

Similar systematic activities are carried on in Canada and the West Indies. Canada alone affords field for a hundred or more syndicates, large and small, operating fleets of power boats and automobiles.

The profits of smuggling aliens are enormous. Government observers state that half a dozen debarred foreigners delivered in Boston through the Montreal gateway may yield as much as $5,000 in profit. The syndicates make charges ranging as high as $1,000 for safe transport, although the usual rates appear to be between $100 and $200 for each delivery. One syndicate is said to use twenty high-powered sedans and touring cars in carrying foreigners into New England after their arrival at the ports of Halifax, St. John and Quebec.

In handling this problem, the border patrol has driven smugglers to constant changes of method. A few years ago, the invaders traveled in comfort on the plush cushions of railway coaches. Alert guardians forced them out of these quarters into box cars and secret compartments in Pullmans—the cramped spaces of

Some of the Trick Containers for Liquors, Top; Beach Patrol in the Far Northwest, and a Scene on the Old Smugglers' Trail from Mexico

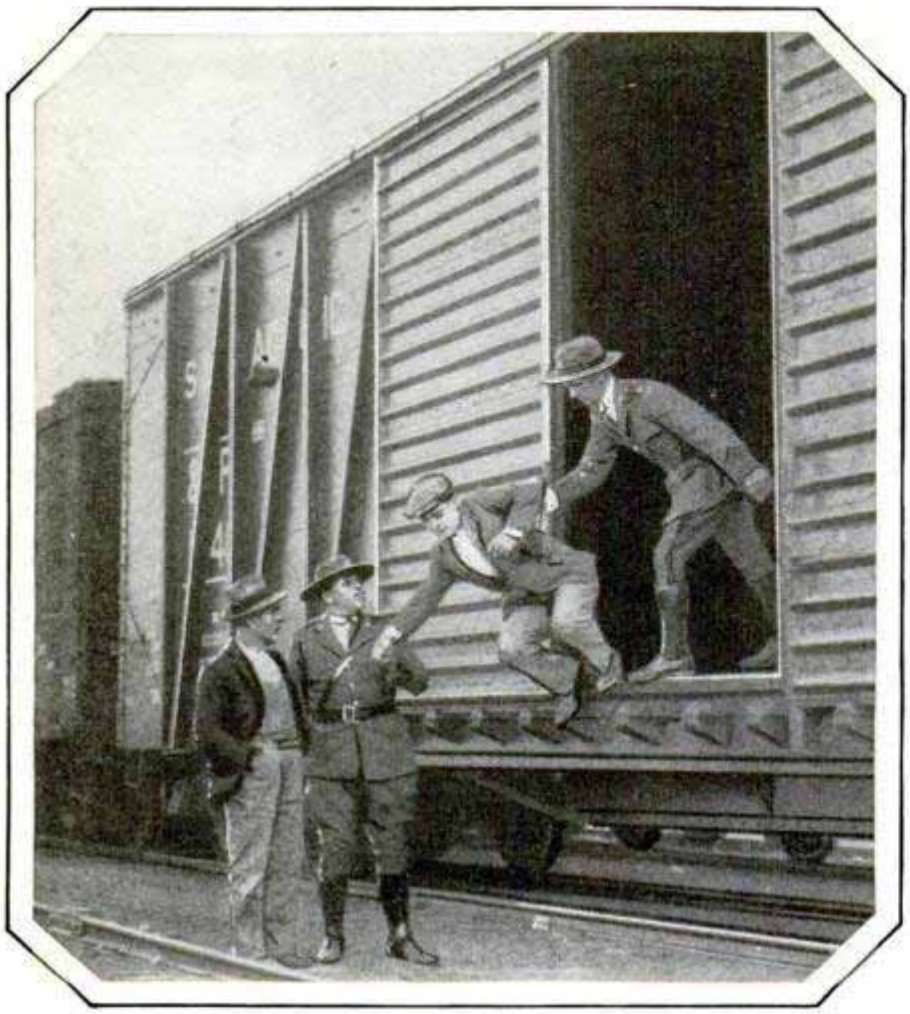
Caught in Texas, an Automobile with a Double Top Was Found to Contain Dozens of Bottles of Whisky Packed Away in a Space Only a Few Inches in Depth

linen closets, the hidden nooks in the ceilings of vestibule platforms, and the storage chests beneath dining cars. Discovery of the varied hiding places afforded by trains forced the smugglers to use covered wagons and automobiles, or to march their patrons across country along hidden bypaths, traveling at night and sleeping behind rocks and trees during the hours of daylight. Every form of conveyance has been employed, and now the patrol faces the problem of smuggling by air. Transport by airplane is regarded as an inevitable development because of its possibilities for secret landings.

The work of the border patrol is colorful and dramatic, with ex-service men as the predominant element in its performance. The selection of material seasoned in the army, navy and marine corps is based on the logic of physical fitness. Typical of the experience of the men on patrol duty was that which befell a group of officers awaiting a band of invaders on the Rio Grande, at a point where the stream is comparatively narrow. The unseen watchers could hear the Mexicans arguing as to the safety of attempting an invasion. Finally one of the men patted his chest with both hands, in a gesture of bravado, and started across in a rude boat known as a "pato." On his approach to the American shore, the officers demanded his surrender, but he opened fire on them. In the ensuing exchange he was shot to death.

The fate of their comrade caused the other lawbreakers to direct an intense fire at the officers across the stream. The Americans were in a badly exposed position on a long narrow peninsula in the bend of the river. The peninsula extended close to the Mexican shore. On this 200-foot strip of land the officers were under crossfire from the front and both sides for a distance of a mile as they sought to return to the mainland at their rear. Escaping fire and going for reinforcements, the inspectors returned to find that the daring Mexicans had retrieved the body of their dead leader and had escaped to their own country.

Patrol inspectors have made successful seizures of pack trains after riding as much as eighty-five miles in a single day, following the tracks of the smugglers. A favorite trick of the outlaws is to reverse the shoes on their horses to make their progress appear to lead in the opposite direction. Another ruse of the smugglers is



Every Freight Train Entering from Mexico and Canada Is Searched by Immigration Officers for Barred Aliens

to cause their horses to leave tracks which seem to be several days old, a feat achieved by using pieces of automobile tires instead of shoes on the hoofs of the animals.

In patrolling the border, the officers lie in wait to "cut" the known trails of smugglers. For open country the patrol uses automobiles. In wild regions, where motor vehicles cannot be taken, the members employ horses. In dense underbrush where horses are barred, they go afoot.

Along the New England coast, the boat traffic lands aliens and contraband in isolated coves as far south as Long Island. In one recent case twenty-five Chinamen were captured by inspectors who intercepted the smuggling boat on its journey from Newfoundland. The aliens were deported, but three weeks later they returned over their original route and reached Boston in box cars as a consignment of "pickled fish."

The wiles employed by smugglers are numerous. One truck entered the United States by way of the international bridge at Van Buren, Me., carrying two men with badges and two handcuffed "prisoners." The badge wearers explained that they were crossing United States territory for a few miles to make a short cut to a Canadian jail. The explanation was good and enabled the gang to bring in liquor valued at $12,000, concealed in the truck with the make-believe captives.

Impersonation is not uncommon. One member of a smuggling party made successful use of the name of Governor Smith of New York. Motoring south from Montreal, this man's car was stopped by inspectors near Rouse's Point. When halted, the driver turned to his passenger and said:

"Well, governor, what do you know about this?"

The "governor" manifested mild surprise, and was allowed to proceed. Subsequent investigation showed that the impersonator had been hired because of his resemblance to the chief executive and that the car bore a generous shipment of contraband whisky.

Motor cars that attempt to rush the gates at patrol stations are frequent visitors at the frontier. At some points the inspectors meet this effort by keeping spiked planks in position to cause an enforced halt for each car that tries to break through the barrier. The spikes make short work of tires and simplify capture. A car caught in this fashion is likely to have a secret compartment in the roof or under the floor for carrying contraband.

On the Canadian border the use of sleighs constitutes an accepted part of the smuggling program for aliens. Near Westville, N. Y., two sleighs came along one day, loaded with passengers. The first vehicle failed to halt when the order was given by an inspector, and made a

rush down the highway. Capturing the second sleigh, the officers pursued the other and arrested a notorious alien smuggler who was in command of the expedition. This lawbreaker was given a three-year sentence and fined $14,000, while the Canadian farmer who owned the sleighs was fined $500 when he made the mistake of claiming his vehicles three or four months later.

LOCK BIGGER THAN PANAMA'S FOR DUTCH CANAL

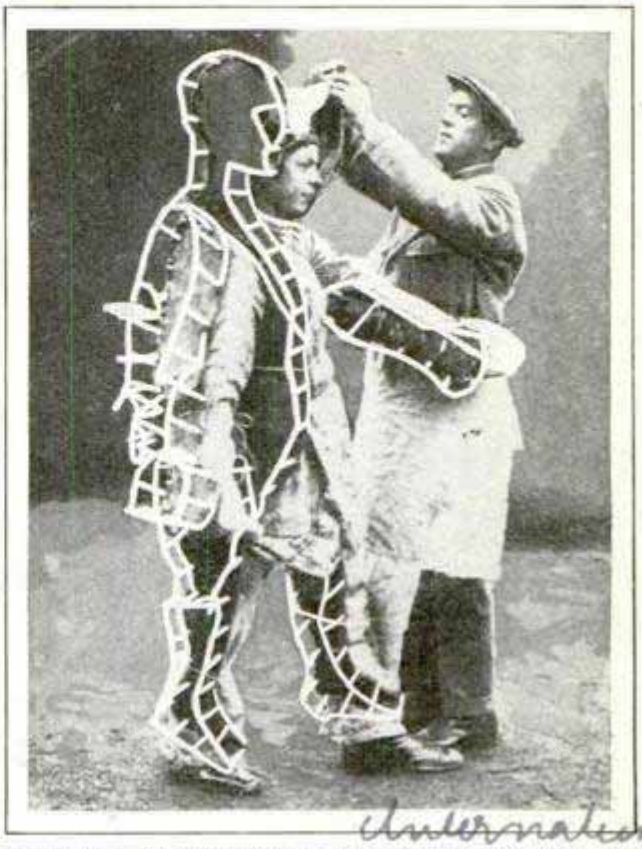
A huge lock, that will dwarf even those in the Panama canal, is being constructed in Holland at the North Sea terminal of the ship channel that connects Amsterdam with the outside world. It will be 1,312 feet long, 164 feet wide and between forty-nine and fifty feet deep. There will be three huge gates, each weighing 2,604,500 pounds. The third is kept in reserve for emergency purposes. The lock will be ready for use next year and is expected to be adequate for generations to come in spite of the steadily increasing size of both naval and commercial ships.

DOG MODELS CENTURIES OLD FOUND IN PALESTINE

Lead models of dogs have been found by an expedition of the University of Pennsylvania in Palestine. The figures are believed to be at least 3,300 years old and show that dogs then closely resembled some of the modern species.

Lead Dog Models Found in Palestine; the Figures Are at Least 3,300 Years Old

WEARING SUIT OF FIREWORKS PRODUCES NOVEL DISPLAY

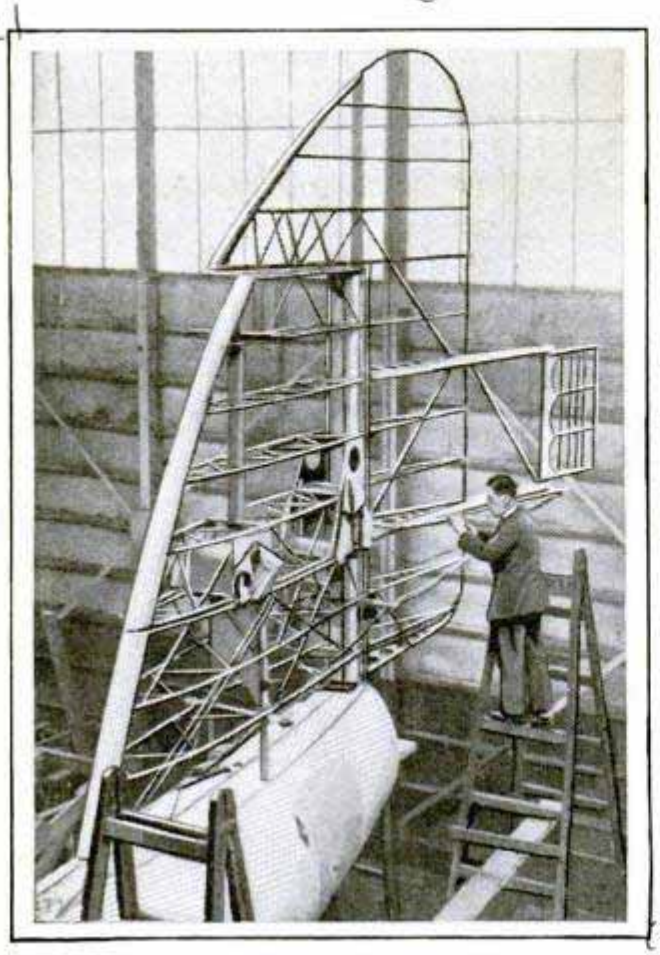


Donning His Suit of Fireworks; an Asbestos Garment Underneath Protects the Wearer

Earning his living as a fireworks model is the somewhat hazardous calling of a young man in London. Although he is entirely covered with an asbestos suit, the task of walking around with several pounds of exploding pieces attached to his person is not without its risk of burns.

TELEVISION AIDED BY QUARTZ AND BETTER SCREEN

By the use of vibrating quartz crystals, the image from a television machine was made to stay more steadily on the screen instead of fluttering and drifting as commonly happens. The crystals served to control the electric oscillation and to synchronize the sending and receiving units more accurately. Another development consists of an improved screen, formed from a large gridlike electric-discharge tube, bent backward and forward, through which the luminescence travels so rapidly that, to the eye, the screen appears to be brilliantly and steadily illuminated. Engineers declare that many improvements must still be made before television becomes practical.



Rudder Skeleton of One of the Huge Air Liners for Service between England and Australia

ENGLAND-AUSTRALIA AIR LINE TO HAVE HUGE SHIPS

Two large air liners are being constructed for the proposed flying route between England and Australia. The ships will be fitted with every modern convenience and aid to aerial navigation. Their tremendous size is evident from the accompanying photograph of part of the framework, showing the rudder skeleton.

TREE TRUNKS SWELL AT NIGHT AND SHRINK BY DAY

With the aid of an accurate measuring instrument, Dr. D. T. MacDougall, of the Carnegie Institution, has determined that the trunks of pine trees shrink in the daytime and expand at night. A reason for this is that during the day, when the sun is shining on the leaves or needles, evaporation of moisture is stimulated and the needles are stretched while the tree is drawn inward a trifle as it attempts to relieve the tension by carrying sap up from the soil. At night, the reverse of this process occurs. With the decrease of evaporation and less tension on the water system, the trunk begins to expand. The intake of water through the roots has a chance to catch up with the outgo from the leaves. The natural elasticity of the wood comes into play and the tree goes back to its natural size. The sensitive measuring apparatus makes a record of the shrinking and expansion over a twenty-four-hour period.

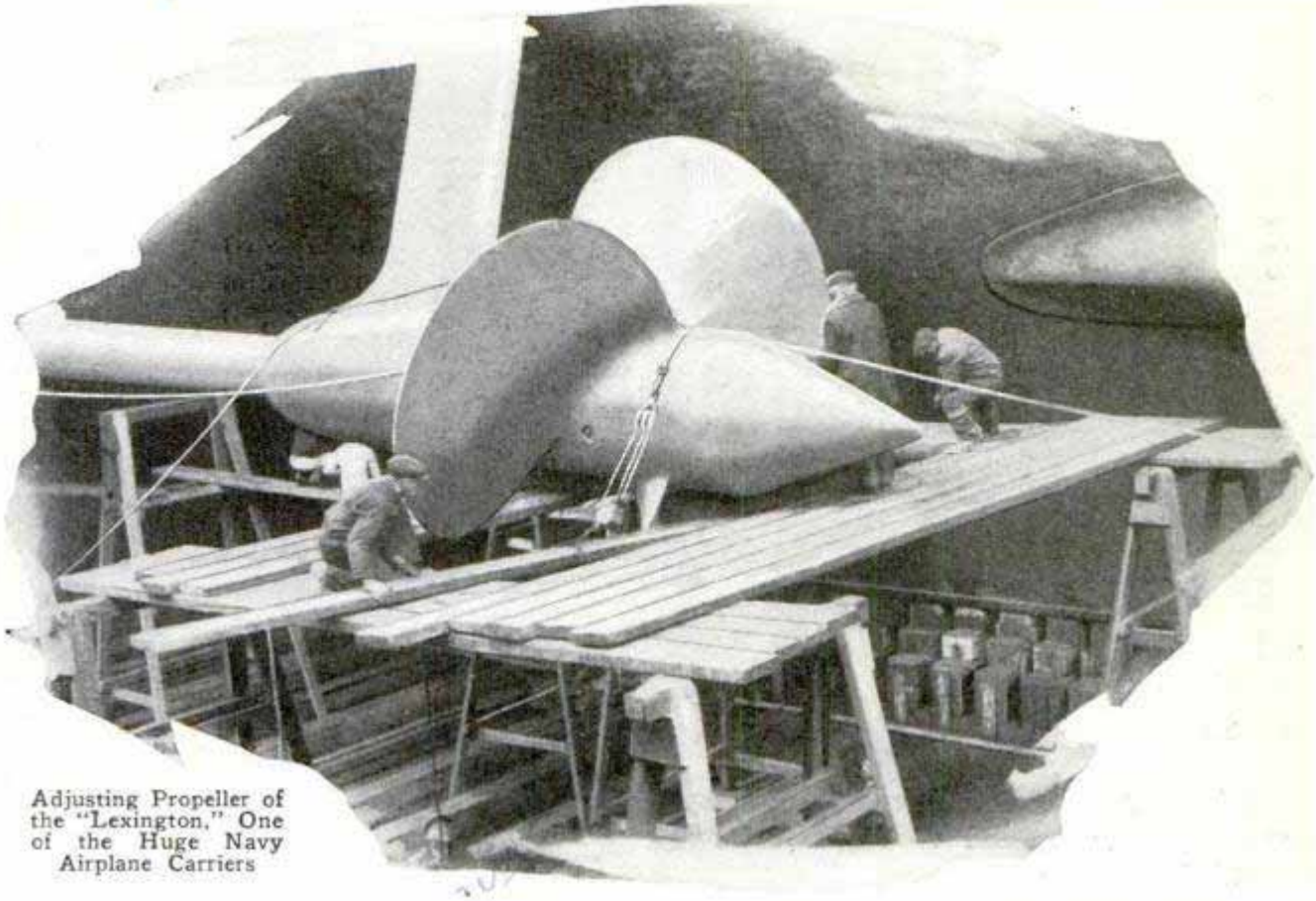
MAN-MADE EARTHQUAKES HELP RAILWAY SURVEY

Causing earthquakes to help the building of a railroad is one of the tasks of engineers engaged in surveying the right of way for the proposed Turkestan-Siberian railway. Explosives are set off under the ground, and the resulting vibrations accurately traced so that the character of the underlying strata may be determined. The study is being facilitated by a special seismograph which traces the vibrations set up by the man-made quakes on photographic paper.

COIN-IN-SLOT SHOE POLISHER GIVES BRIGHT SHINE

Both shoes are shined at once in a coin-in-the-slot polisher that requires no human attendant. It wipes off the dust, applies the polish and rubs the shoes briskly for a finishing luster, all for a nickel, and the operation takes less than two minutes. It is designed to fit shoes of any size.

Both Shoes Are Shined in Less Than Two Minutes in This Automatic Outfit



Adjusting Propeller of the "Lexington," One of the Huge Navy Airplane Carriers

CLEANING BIG PLANE CARRIER GIANT TASK OF THE SEA

Although the huge airplane carriers of the United States navy are expected to contribute greatly to the effectiveness of the fleets, they require much the same grooming and attention as a battleship, and barnacles are just as likely to impede their progress as that of the other fighting craft. The huge proportions of the "Lexington" were emphasized recently when the vessel was brought into drydock for cleaning and painting the hull and adjusting the propeller. The "Lexington" and the "Saratoga" were originally designed as battle cruisers of more than 43,000 tons.

ICE AT SOUTH POLE SUFFICIENT TO COVER WHOLE WORLD

There is enough ice piled around the antarctic regions to cover the entire surface of the world to a depth of more than 100 feet, in the opinion of Prof. W. Meinardus, of the University of Goettingen. He believes that ice has been accumulating there for a quarter of a million years or so. If all the ice were melted, it would raise the ocean level approximately 100 feet. The weight of the huge ice pack is estimated at twenty quadrillion tons. Although there are elevations of 6,000 to 10,000 feet, Prof. Meinardus believes that most of the peaks consist of accumulated ice, and that the rock on which it rests is seldom over 2,000 feet above sea level.

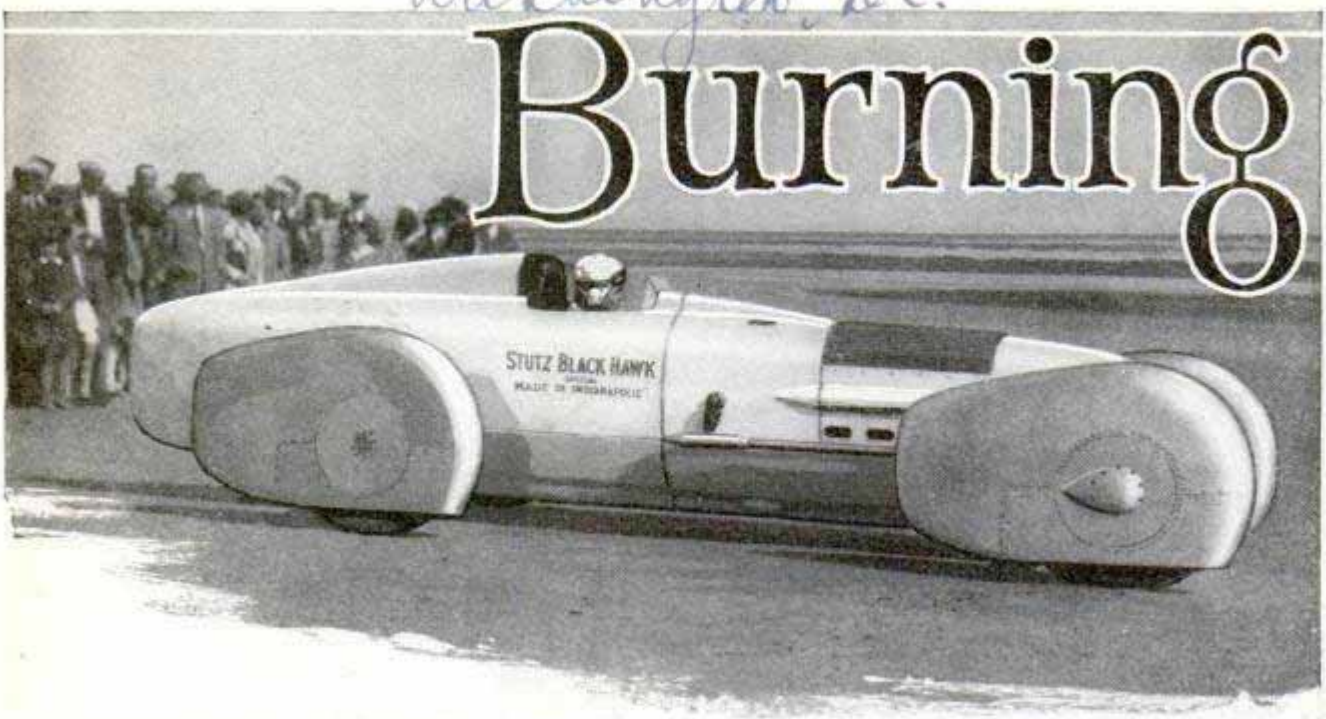
CITY INSTALLS VANITY MIRRORS FOR PEDESTRIANS

Mirrors installed at convenient places on the streets of Portland, Oreg., with signs directing attention to various articles of apparel, help pedestrians keep themselves neat and tidy. They have proved popular with men as well as with women.

To Help Pedestrians Keep Neat; Wayside Mirror with Its Sign on Portland, Oreg., Street

313 Chas. Wheat Stewart Wilcox
National Press Bldg
Washington, D.C.

Burning



Frank Lockhart's Racer before His Plunge into the Ocean While Traveling Faster Than 200 Miles an Hour; Building Tires to Stand Such Speed Is a Fine Art

ARE automobile tires wearing out faster, and, if so, why, and what can be done about it?

They are, says Akron, rubber capital of America, and the bureau of standards at Washington agrees.

As regard the why, you can check off greater speed, lower-hung cars with smaller wheels, four-wheel brakes, and last, but not least, free air.

And, as for what can be done about it, test fleets are driving day and night, 600 miles per car every twenty-four hours; laboratories in Akron and Washington are working overtime, and inventors are racking their brains to improve the breed of tires and build longer life into them.

But the car owner himself can solve his personal tire problem by heeding the lessons the laboratories and the test drivers have already learned.

Here they are:

Lesson 1: If you want to increase your average driving speed from thirty to forty-five miles an hour—a fifty-per-cent increase—you must expect your tires to last only half as long, for they will wear out twice as fast.

Lesson 2: If you want small wheels and a modish, low-hung car, the tire bill will carry with it a twenty-two-per-cent decrease in mileage.

Lesson 3: If you overinflate your tires because the air is free and the pressure high, you will get forty-five per cent less wear out of them.

An automobile tire is simply a heavy rubber band, called the tread, built onto a rubber and fabric tube, designed to withstand the air pressure within it. The manufacturer tries to build enough tread to last as long as the sidewalls will stand up. If something happens to increase the rate of wear on the tread, all his calculations have gone wrong.

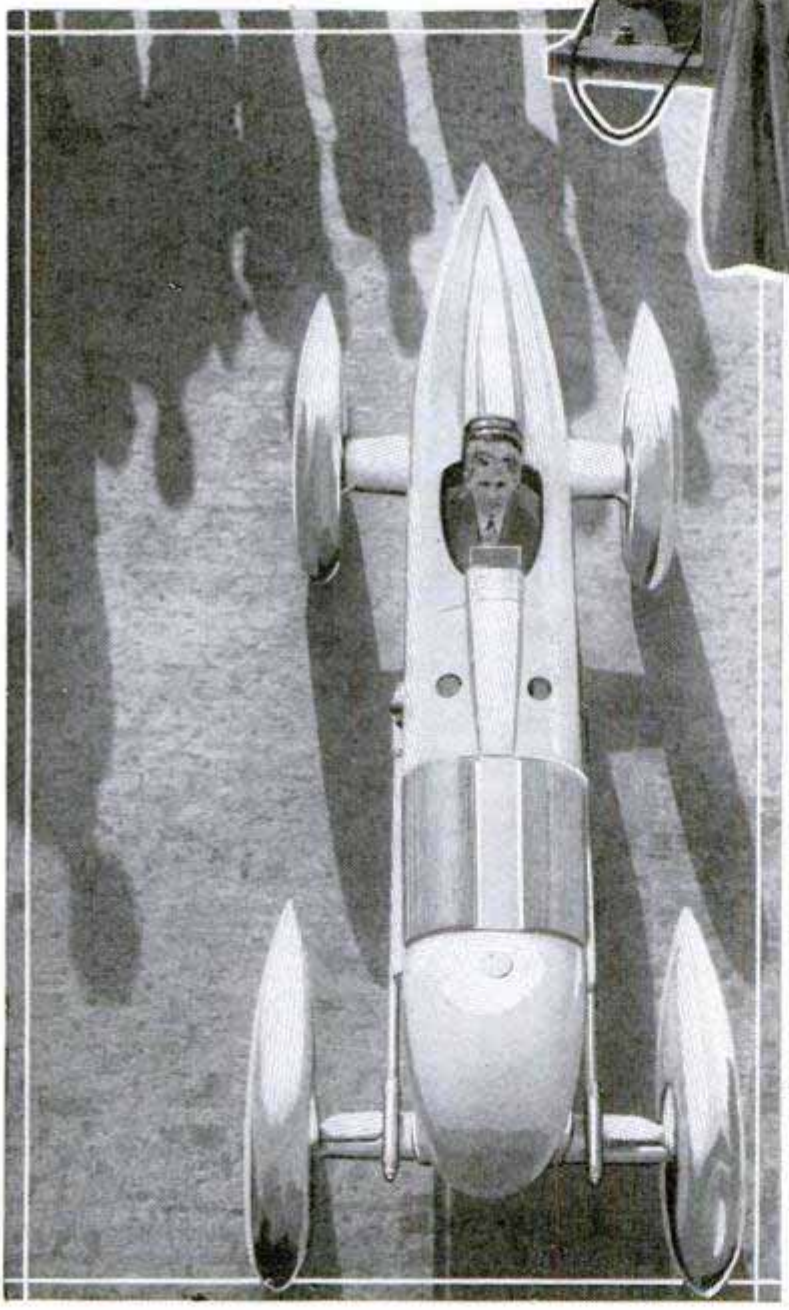
And within the last three or four years much has happened to make treads wear out faster. Traffic has been speeded up everywhere, on improved country roads and on city streets. Tests on the road and in the laboratory show that, for every fifteen miles of added speed above thirty or thirty-five miles an hour, the rate of wear is doubled. In other words, at forty-five miles an hour the life of a tire is halved; at sixty miles, it is halved again, or a car driven consistently at a mile a minute would wear out four sets of tires for every set required at a speed of thirty miles an hour.

Greater speed means more braking and a heavier foot on the pedal, for with every increase in speed the number of emergency stops required goes up. This is particularly true since the widespread adoption of stop-and-go lights in cities. Engineers of the Miller Rubber company found that on tests made, speeding a car

'em Up

from a dead stop to thirty-five miles an hour then slowing down to a dead stop as quickly as possible without locking the wheels, the tread wear per 100 miles increased 2,500 per cent.

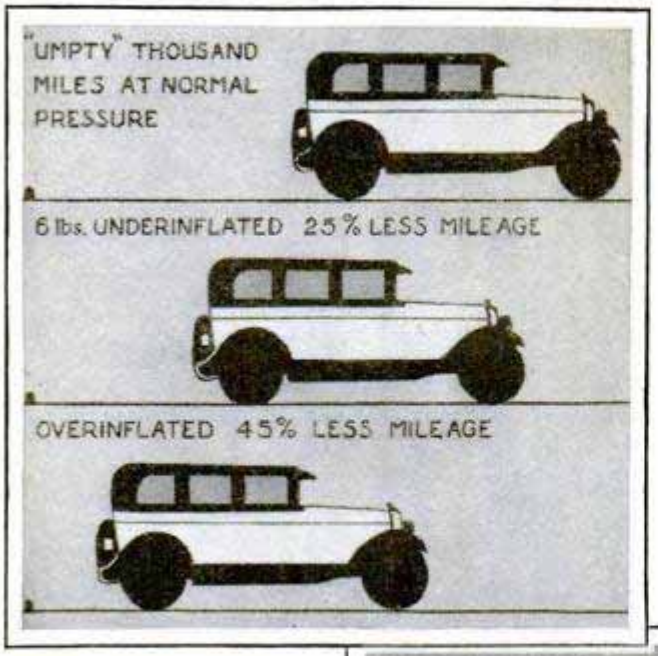
Engineers of the Goodyear Tire company tested a truck by running it at thirty-five miles an hour, coming to a dead stop every quarter of a mile, braking down as fast as possible without skidding, and discovered they wore off one-half the tread design in a little more than 100 miles. With four-wheel brakes on passenger cars, they found the car could be stopped quickly without locking the wheels, thereby spreading the wear over the entire circumference instead of acquiring flat places from abrasion, but tire wear was just as fast.



Testing Samples of Tire Fabric on an Abrasive Wheel, and Lockhart's Streamlined Car, as Seen from Above

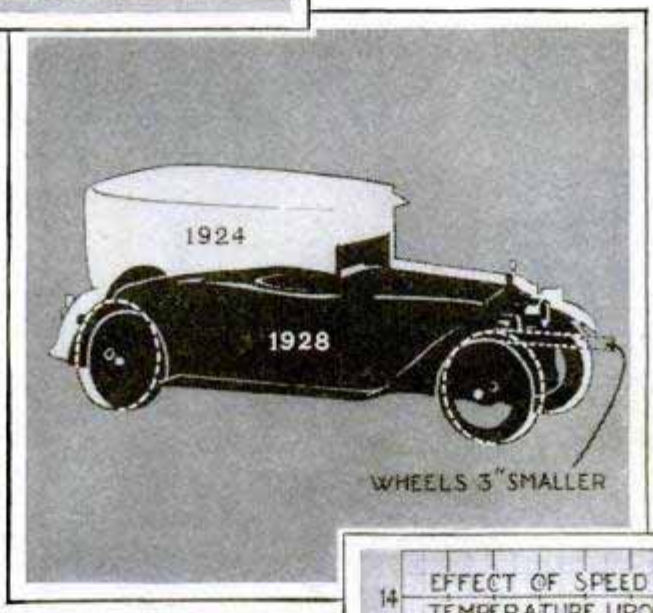
And as for free air—in the old days, when tires were pumped up with back-breaking toil by hand, an overinflated tire probably was a rarity and underinflation more or less common. Underinflation cut the life of tires by twenty-five per cent. Then came free air from power pumps and overinflation followed, with a loss of forty-five per cent in average mileage.

The smaller wheels have brought their own troubles. Taking three inches off the diameter of the wheel decreases the circumference of the tire only nine



Courtesy Goodyear Tire Co.

Over or Underinflation, and the New Type Smaller Wheels Are Both Responsible for More Wear on Your Tires

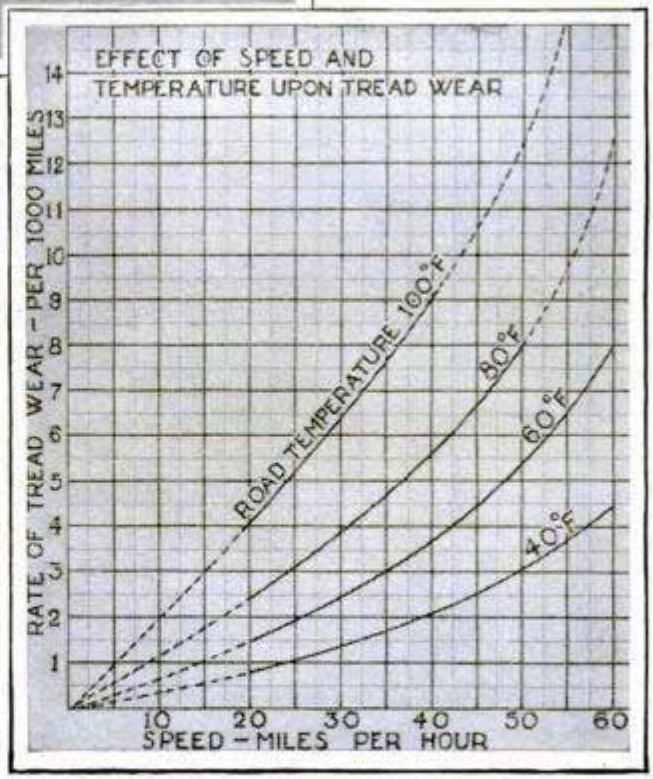


and a half inches, but increases its wear by twenty-two per cent, the Goodyear engineers have found.

The Miller laboratory explains their tests indicate "that the increase in rate of tread wear due to decrease in tire diameter is not in direct proportion but greater than the increase in revolutions per mile." The reason is that the portion of the tire in contact with the road does not vary in proportion to the change in diameter. The deflected radius of a 31 by 5¼ tire is 15.17 inches, and that of a 28 by 5¼ tire is 13.88 inches. The larger tire makes 664.5 revolutions per mile and the smaller one 726—a difference of nine and a quarter per cent, which indicates an increase in tread wear on the smaller wheel of between fifteen and twenty per cent, although the smaller size will have but ten per cent more road contact in a mile. One reason for the greater wear of the smaller tire is the heat generated by slippage.

With thousands of miles of improved roads being added to the nation's total of paved highways each year, car owners have naturally looked for greater life from their tires. But, the tire makers point out, there still remain many miles of medium, poor and bad roads, and the total range of all driving surfaces shows 500-per-cent difference in the degree of abrasiveness which causes the tire wear. Any paved highway is better than the old graded roads. A road of crushed rock, with its many sharp edges, is harder on tires than smooth, washed gravel from a creek bed. And snow is responsible for practically no wear.

A dozen years or so ago, when it was customary to lay up most cars for the winter, cold weather was popularly supposed to be bad on tires. As a matter of fact, the effect of lower temperature is just the reverse, and tires will wear longer in cold weather than they will in hot. A tire could be frozen in a solid cake of ice and left for a long time without damage, for the tensile strength of vulcan-

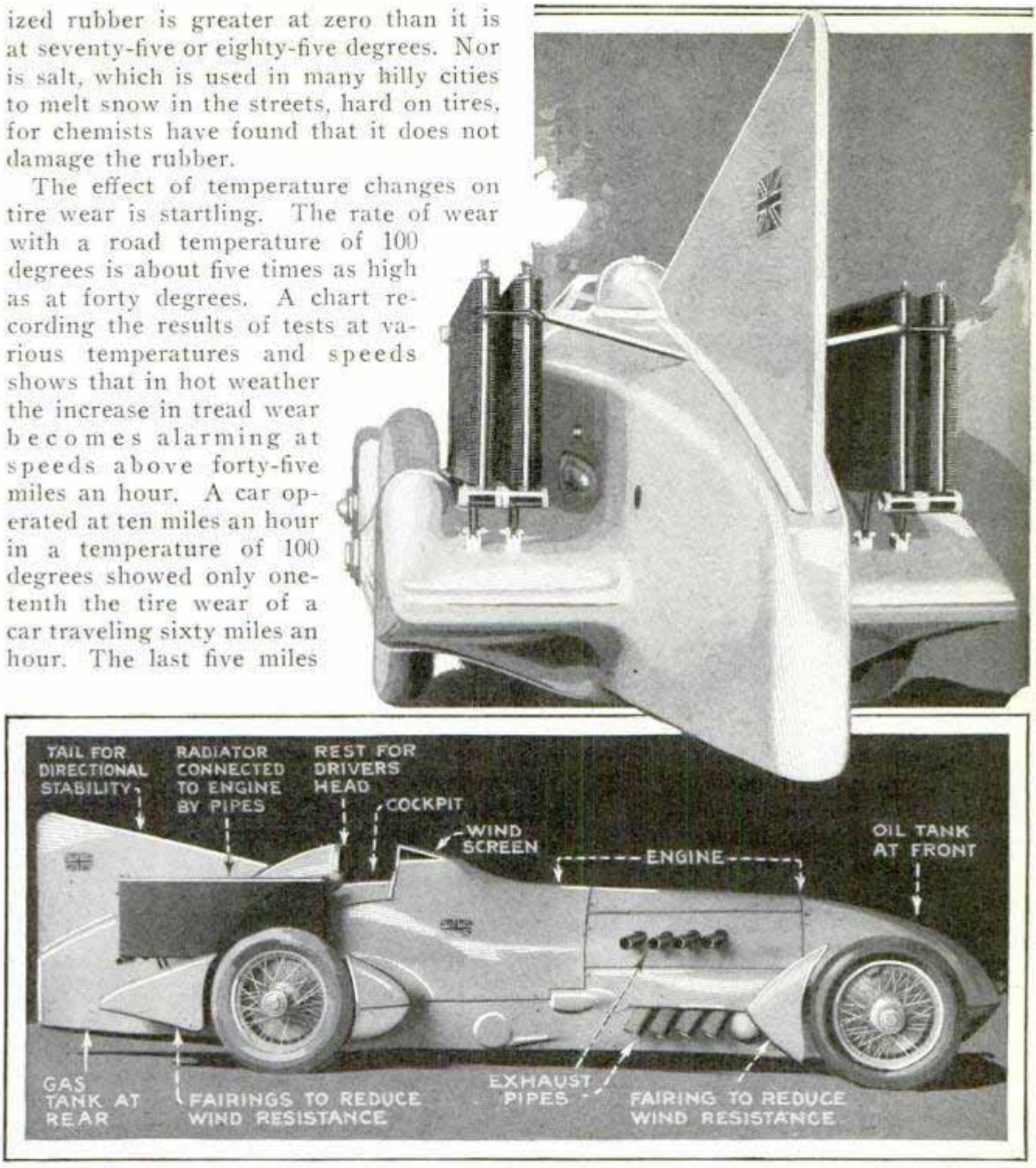


Courtesy Miller Rubber Co.

Chart Showing the Effect of Increased Speed and Higher Temperature on Tire Wear

ized rubber is greater at zero than it is at seventy-five or eighty-five degrees. Nor is salt, which is used in many hilly cities to melt snow in the streets, hard on tires, for chemists have found that it does not damage the rubber.

The effect of temperature changes on tire wear is startling. The rate of wear with a road temperature of 100 degrees is about five times as high as at forty degrees. A chart recording the results of tests at various temperatures and speeds shows that in hot weather the increase in tread wear becomes alarming at speeds above forty-five miles an hour. A car operated at ten miles an hour in a temperature of 100 degrees showed only one-tenth the tire wear of a car traveling sixty miles an hour. The last five miles



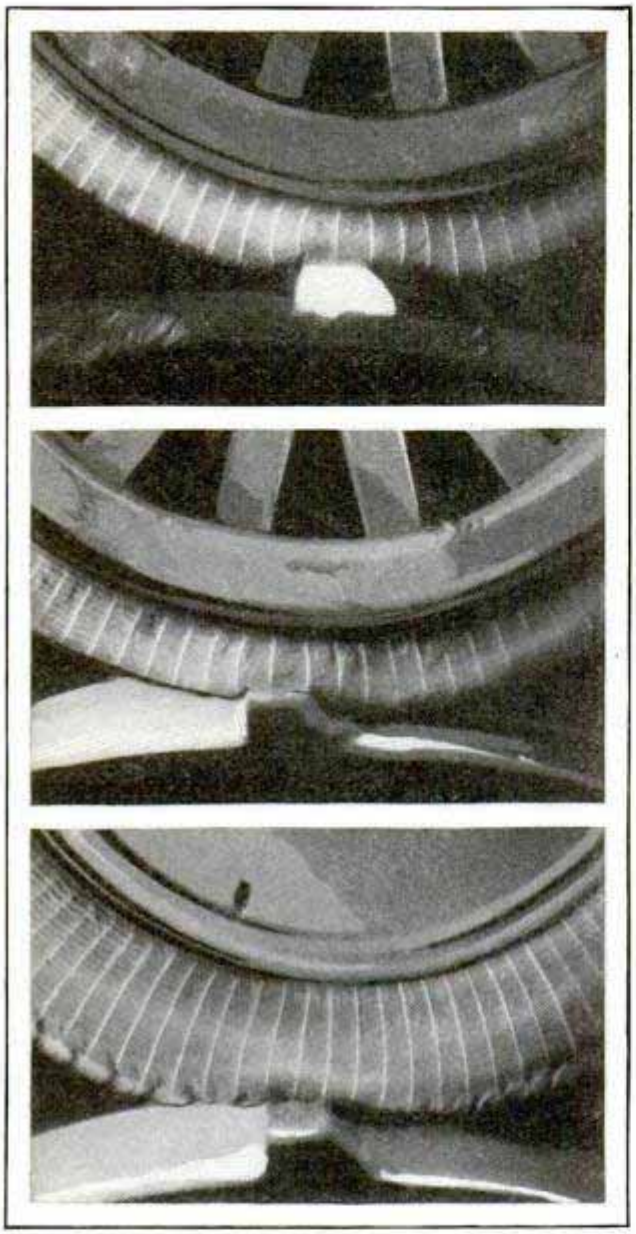
Capt. Malcolm Campbell's "Bluebird," Present World-Record Holder; Above Is a Rear View Showing the Rudderlike Fin, to Prevent Skids, and the Pair of Radiators

of speed, between fifty-five and sixty miles an hour, cost a twenty-five-per-cent increase in tread wear.

There are several other causes of excessive wear, such as badly balanced brakes, misalinement of wheels, and the increased tire slippage at higher speeds. As the speed goes up, there is considerably more swerving and more axle bounce, due to rough spots in the road, and both of these mean greater tread wear.

Tires run on the test fleet of the Miller Rubber company show that wear is greater in dry weather than in wet, while on snow wear is practically nonexistent. Highly crowned roads increase wear because they have a tendency continually to roll the tire to one side, and if such a road is rough, the wear is even greater. In a hilly or mountainous country, where there is considerable second-speed pulling and much braking going downhill, tires will wear out faster than on level roads.

The importance of proper inflation is



High-Speed Movies; Top, a Cushion Tire, Clear off the Ground; Center, a Solid Tire, and, Below, a Balloon Absorbing the Shock

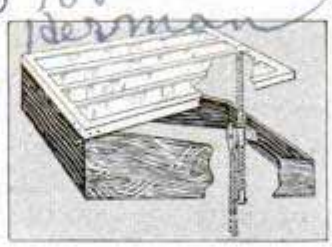
stressed by all the manufacturers. Revolving at high speed, the tire is constantly being compressed and expanded as each part passes under the load. This high-speed flexing produces heat within the tire, just as a piece of metal, bent rapidly back and forth to break it, grows hot under the treatment. At the proper inflation point, however, the flexing is less than in either an overinflated or underinflated tire, and hence there is less internal heat.

Manufacturers are experimenting with a wide variety of tread designs to permit the tread to "give" under road shocks, without straining the tire or causing tread wear through its sidewise roll. At the bureau of standards laboratory, a tire is run back and forth under pressure against a sheet of thick plate glass and the distortion of the tread photographed. At the Firestone plant, in Akron, a super-speed camera, invented by C. Francis Jenkins to photograph the flight of bullets and reduce them to slow-motion movies, is used for the same purpose. Instead of taking the usual sixteen pictures a second, stopping the film an instant for each exposure, the Jenkins camera takes 3,200 pictures each second, and uses forty-eight lenses, revolving before a constantly moving film, to make the exposure possible.

Films taken with it show a tire actually disintegrating under road wear, and when the movie is run off at the usual rate of speed, the tread wear can be studied and analyzed. Comparative pictures of hard rubber, high-pressure and balloon tires show on the film how the softer tires, when run over a rock or bump, give until they fit themselves around the object and absorb the shock. The movie films have proved useful in designing tires for high-speed racing cars.

British tire builders discovered more than a year ago, when building the tires for Maj. Seagrove's "Sunbeam," which set up a record of more than 203 miles an hour—recently broken by Maj. Campbell, another Englishman—that they had entirely new factors to deal with. Because the tires were to be used for a few moments at a time only, and on comparatively soft sand at Daytona beach, Fla., they required less tread, but the sidewalls, or "carcass," of the tire had to be considerably strengthened to withstand the terrific centrifugal forces when revolved at such high speeds.

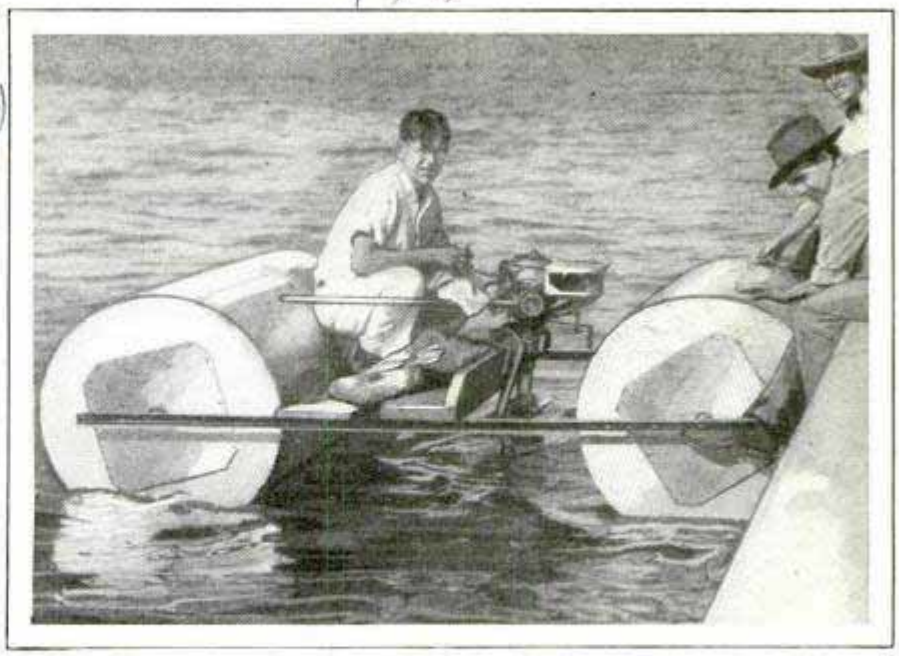
CHAIN LIFT FOR SKYLIGHTS AIDS VENTILATION



Large or small skylights are easily raised or lowered by means of a chain and cog-wheel arrangement which is easily installed and securely locks the skylight so that it cannot be opened further from the outside. Any degree of elevation is attained so that proper ventilation can be had with little trouble.

HOOF-AND-MOUTH SERUM HELPS TO SAVE CATTLE

Progress in curbing the hoof-and-mouth disease is reported from Germany as a result of using a special serum prepared from animals which have been made immune to the disease by constantly increasing doses of the virus. Inoculation is practiced in three ways. The first is a protective treatment, merely temporary in effect and rendering the animal immune for ten days. The second is given simultaneously with an artificial infection of the disease virus itself, and the third is a curative inoculation given to cattle that have contracted the disease if it has not reached an advanced stage. Satisfactory results have been reported when the treatment was administered during the earlier stages.



Boat That Rolls on Water with Motor Attached; the Idea Was Inspired by Seeing Two Tin Cans Floating in a Stream

BOAT THAT ROLLS ON WATER LATEST IN MOTOR CRAFT

From seeing empty tin cans roll along on the surface of the water, a southern inventor obtained the idea for a novel motor craft. It consists chiefly of two galvanized-iron drums on axles with an outboard motor between the two cylinders. While the outfit does not develop great speed, it is unsinkable and will support considerable weight.

RUBBISH WAGON IS INCLOSED TO PREVENT DUST

Greater cleanliness in handling street rubbish is possible in Potsdam as the result of the introduction of a special truck. Its body is in the form of a cylinder. The small containers are emptied into it through a rear opening and, when the truck itself is dumped, the load pours out through the bottom. The arrangement also prevents spread of unpleasant odors.

Filling Rubbish Wagon Which Traps Most of the Dust and Odors

DYNAMITE DUST CURES OATS OF SMUT DISEASE

As a substitute for more laborious processes, a dynamite-dust treatment is being given oats to eradicate smut, one of the most destructive of the diseases that attack the grain. The dust is infusorial earth, a base used in dynamite manufacturing. Being porous and dry, it absorbs the formaldehyde solution that is used to kill the smut-fungus spores, carrying the poison through the grain when mixed with the oats. The dust is also treated with iodine vapor to kill the pest. It cleans the grain at a cost of less than five cents a bushel.

KIT OF PAPER SOAP AND TOWELS LATEST TRAVEL AID

A Quick but Thorough Toilet with Paper Soap and Towels; the Entire Kit in Foreground

One of the most recent conveniences for the auto tourist, camper or picnicker is a kit of towels and soap in paper form. It comes as a small flat package that requires little space and contains sufficient materials for twelve complete washings. The soap paper is held in the hand, water applied and the paper rubbed. A thick lather quickly forms and the piece is used as a wash rag would be under ordinary conditions. The towels are of a stout, absorbent grade and may be dried and reused if desired.

GOLF TEE HAS ARROW GUIDES TO AID CORRECT STANCE

Many poor shots in golf are due to improper stance and in order to correct this difficulty, a tee has been introduced that has two arrow guides set at right angles so that the player may take his position in a more effective relation to the line of the ball's flight. With the tee is furnished an aluminum pin, by means of which it is held securely to the ground.

FIRST HORSES SMALL AS CATS AND HAD FOUR TOES

In body and features, the first horses, believed to have lived about 55,000,000 years ago, closely resembled the animals of today except that they were about the size of cats and had four toes. A cast of the skull of one of these early specimens, and a model showing the animal as it probably appeared in life, are on exhibit at the Field Museum of Natural History. The skull was found in the Wyoming "Bad Lands." Other skulls and models are displayed, showing that the horse gradually increased in size and had three, two and subsequently one toe or hoof as at present.

SILENCE SHUTTER ON PHONES PREVENTS OVERHEARING

So that "aside" conversation cannot be heard by the person at the other end of the telephone, a silencer shutter has been devised for the mouthpiece. It acts as a hand does in covering the diaphragm and is moved into position simply by turning a little lever like that of a camera shutter. The proper adjustment is shown by the words "speak" and "silent" on the diaphragm cover.

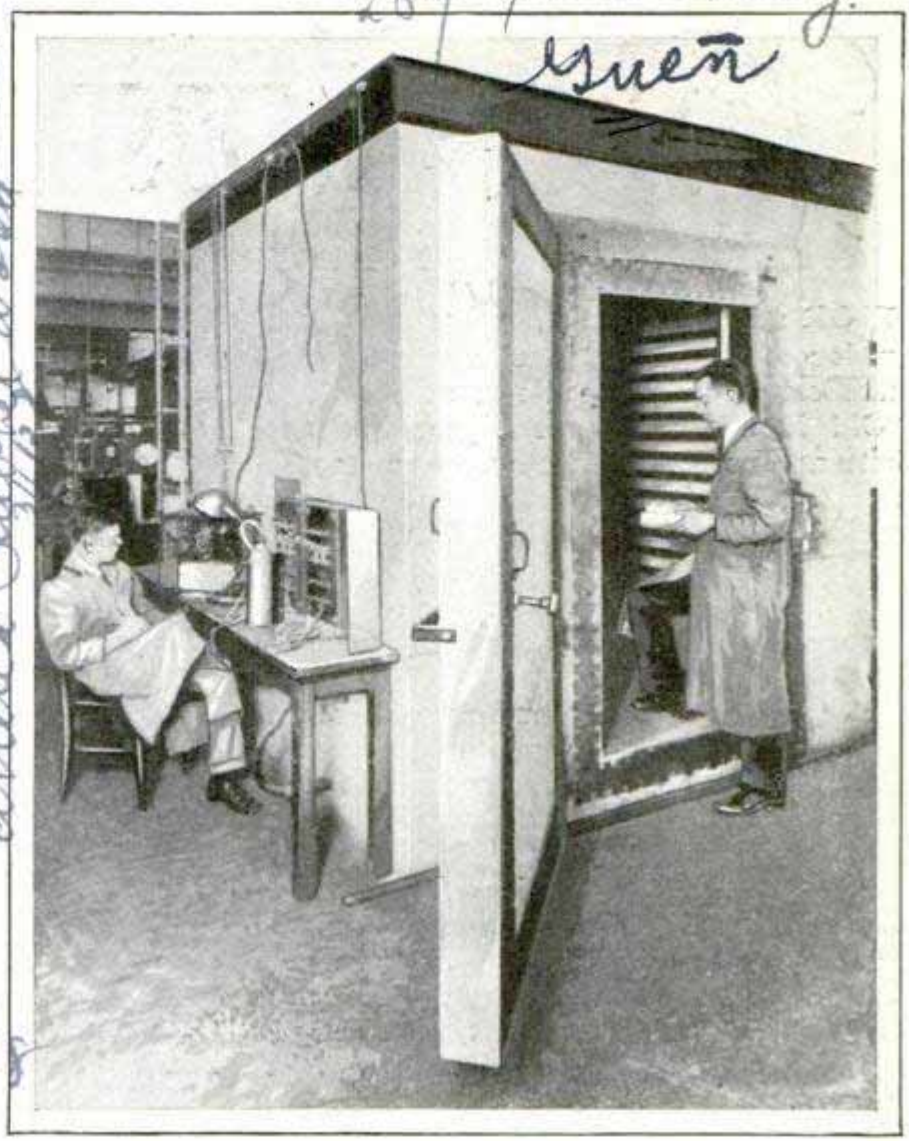
POULTRY-BROODER VENTILATOR SERVES AS SMOKESTACK

Designed to fit any poultry-brooder stove and to offer a protection against roof fires, a combination smokestack and ventilator has been introduced by a California man. The ventilator part is of galvanized iron, twelve inches in diameter, and the brooder pipe runs through the center. A slide at the bottom of the ventilator serves to open or close the draft.

Leather dust is used in making fertilizer.

RUBBER LIGHTER THAN CORK

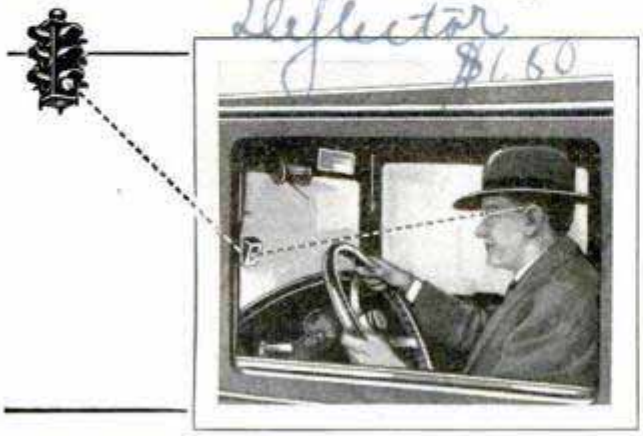
Many important uses will be found for a "foam" rubber recently developed, engineers declare. It is said to be one of the lightest known solid substances, having about one-fourth the specific gravity of cork. Unlike ordinary sponge rubber, which has large pores, this material is not usually permeable to fluids and is said to have excellent heat-insulating qualities. It is formed by injecting a special gas under high pressure into the rubber compound while it is being vulcanized. Life preservers, etc., may be prepared from the substance, it is predicted.



Placing Tray of Insect Specimens in the Temperature Cabinet to Study Effects of Hot and Cold upon Them

PRISM HELPS AUTO DRIVER SEE SIGNALS

Drivers of closed cars often have considerable difficulty in seeing overhead traffic signals, but this obstacle is said to be overcome by using a special prism on the windshield. It is adjusted to deflect the rays of the beacon into the field of the vision, so that the driver need not stoop or lean out of the car to see when the light changes. The unit is easily attached and does not interfere with driving.



Illustrating How the Prism on Windshield Directs Rays from Overhead Traffic Light for Drivers' Aid

WEATHER IS MADE TO ORDER IN WAR ON INSECTS

Winter and summer temperatures are quickly produced in a testing cabinet developed at the Massachusetts Institute of Technology, to aid in the study of insect pests that damage orchard and forest trees. Today, the interior of the box may be mild and pleasant in warmth. Five days later, the thermometer will show thirty degrees below zero. While one observer keeps careful record of the temperature changes, artificially induced, another places trays of the insects into the cabinet and, after a certain length of time, the specimens are examined to determine the effect of the "made-to-order" weather.

¶Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

The IRON HORSE SNORTS

By HUBERT MALKUS, 45 Seaside Ave Stamford, Conn.

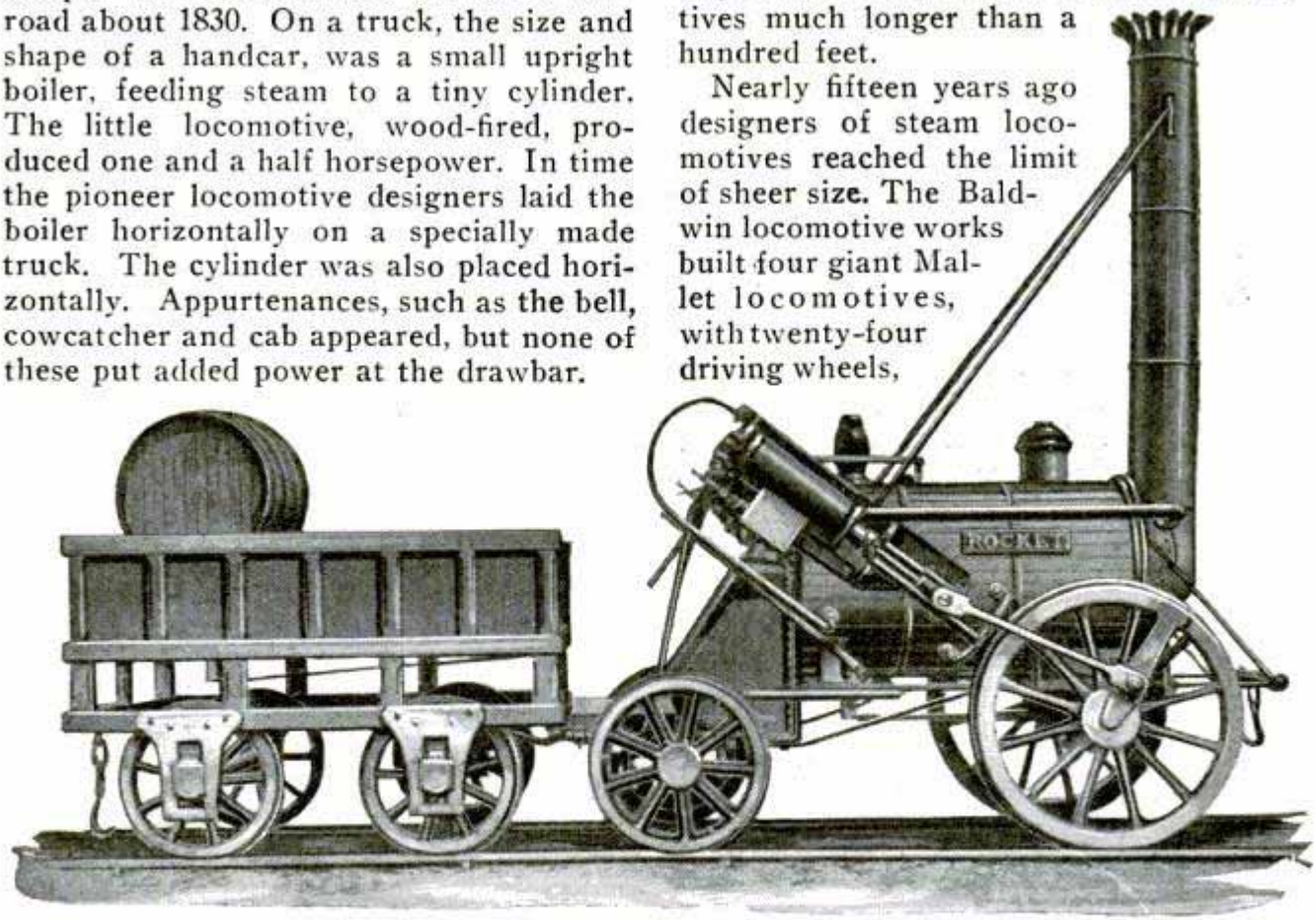
FOR nearly a hundred years the steam locomotive grew in size alone. Mechanically it developed not at all. The "Old Iron Horse" got bigger but not better. Incredible as it may seem to the age that perfected the automobile, the radio and the airplane, the "Tom Thumb" of 1830, no bigger than a handcar and weighing scarcely a ton, was as good a locomotive as many of the 250-ton monsters in service today.

In principle, the amusing and crude little contraption that supplanted the horse as the motive power of American railroads a century ago was exactly the same as the huge steel mastodons of the present. They are just boilers on wheels, generating steam to propel themselves and a train.

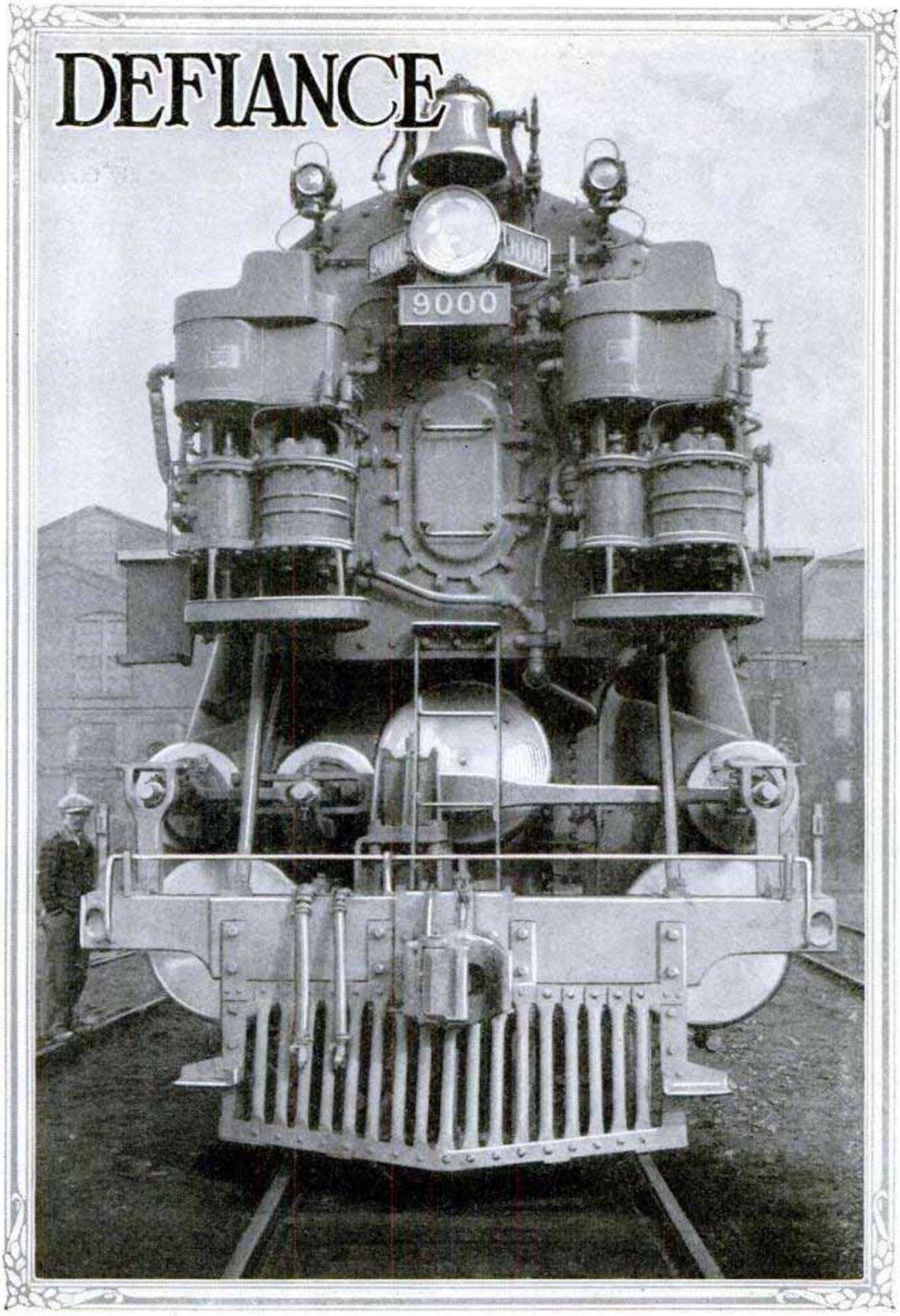
The "Tom Thumb" was built by Peter Cooper for the Baltimore and Ohio railroad about 1830. On a truck, the size and shape of a handcar, was a small upright boiler, feeding steam to a tiny cylinder. The little locomotive, wood-fired, produced one and a half horsepower. In time the pioneer locomotive designers laid the boiler horizontally on a specially made truck. The cylinder was also placed horizontally. Appurtenances, such as the bell, cowcatcher and cab appeared, but none of these put added power at the drawbar.

As the demands of American railroad traffic increased, locomotives were made more powerful by increasing the size of the boiler, by increasing the size and number of cylinders, and by adding to the number of driving wheels. But fundamentally they were all just big "Tom Thumbs." For many years the steam-locomotive designers were able to keep up with the rapid growth of railroad tonnage simply by enlarging the scale of their blueprints. But this convenient method could not last forever. There is a limit to the size of a locomotive. The weight must not be more than the rails and bridges can safely support—400 or 500 tons. Clearance in tunnels and cuts limits height to fourteen to sixteen feet and width to nine to eleven feet. Curves in the roadway make it impractical to build locomotives much longer than a hundred feet.

Nearly fifteen years ago designers of steam locomotives reached the limit of sheer size. The Baldwin locomotive works built four giant Mallet locomotives, with twenty-four driving wheels,

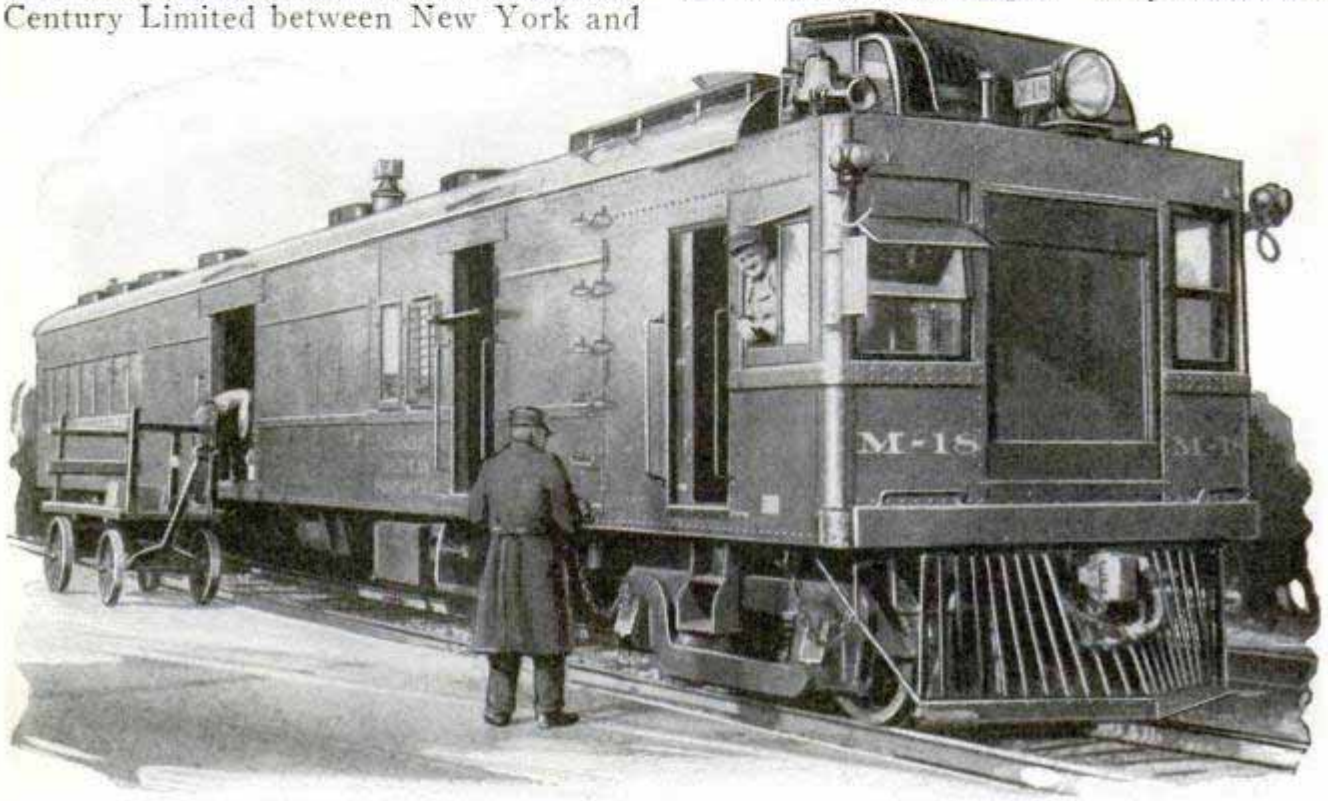


The Granddaddy of All Locomotives, Stephenson's "Rocket," Was Just a Tall Smokestack Followed by a Small Boiler and a Pair of Oblique Cylinders, with Water in a Barrel



A Three-Cylinder Engine with the Added Cylinder Head Showing Just above the Pilot; Note the Bell, Which Has Been Moved Forward Where It Can Be Heard Far Ahead

and six cylinders, three feet in diameter. The engine with tender was 106 feet in length and the weight 860.350 pounds. This giant had a tractive force, or pulling power, of 160,000 pounds. Its great strength can be understood by comparison with the new Hudson-type engines of the New York Central, which haul the twelve to fifteen coaches of the Twentieth Century Limited between New York and Chicago at a speed at times exceeding seventy miles an hour, yet have a tractive force of only 42,000 pounds.

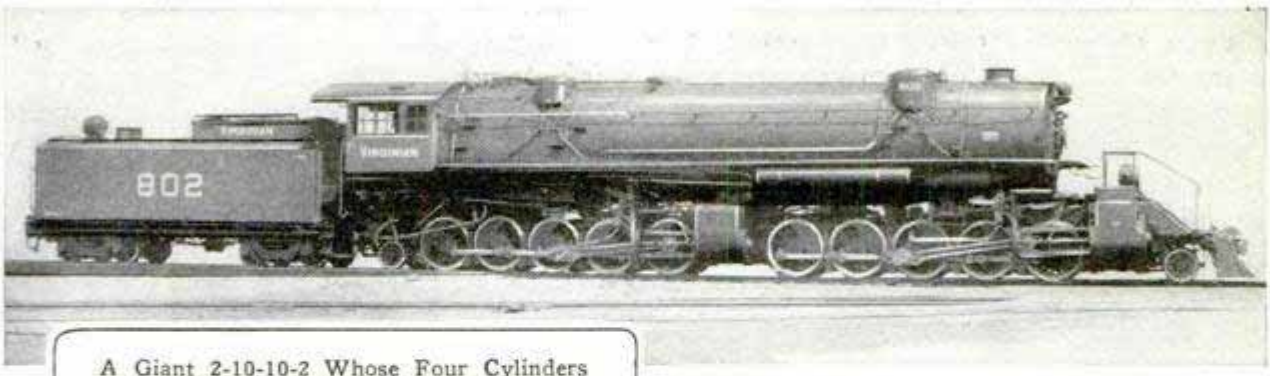


Built to Carry Mail, Express, Baggage and Passengers, and Haul a Trailer or Two if Necessary, the New Gas-Electric Coaches, Capable of Making Sixty-Eight Miles an Hour, Are Displacing Accommodation Trains

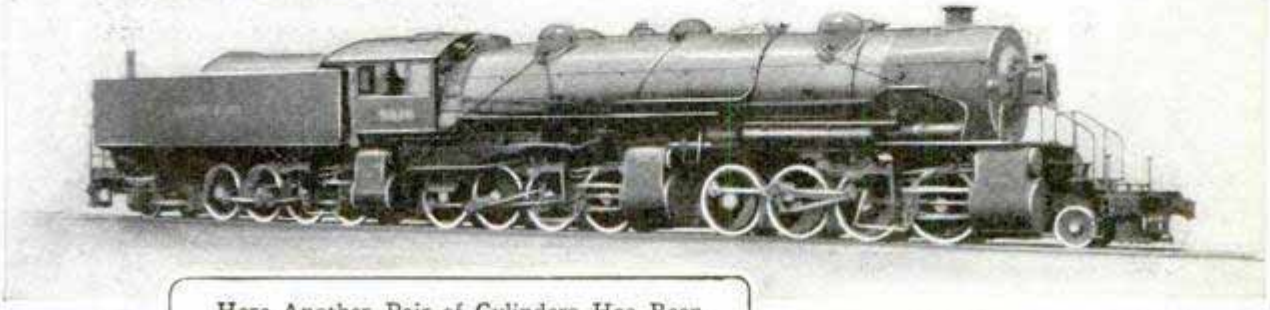
The Virginian railroad, which bought one of these huge Mallets, needed a still more powerful locomotive for mountain service. So, on their order, the American locomotive company built, in 1918, the most powerful locomotive the world has seen. With four cylinders, two of them thirty inches in diameter and two four feet, and twenty driving wheels, this gigantic Mallet developed a tractive force of 176,000 pounds. It weighed 898,000 pounds—nearly 450 tons.

But this giant, despite its great power, was too slow. Freight trains jammed up on both sides of the mountains like logs in the spring drive. The Virginian abandoned its steam giant, cut it up into two locomotives, and electrified part of its line. The old iron horse, the largest ever built, was driven in disgrace from the rails. Electric locomotives now pull bigger trains over the mountains, not at six or seven but at fifteen to twenty miles an hour. When the great Virginian Mallet was displaced by electric locomotives, the steam designers realized tardily that they would have to make better engines without making them bigger. They had made as big an engine as the track conditions would permit—but it was not big enough. The problem was to increase the boiler capacity without enlarging the boiler. In the designing room it is possible to create a locomotive of any desired speed, or any desired hauling power. It is all a matter of the size and number of driving wheels and pistons. Large driving wheels, moderate-sized cylinders and a short piston stroke make a fast passenger locomotive but one without tremendous hauling power. Small driving wheels, large cylinders and a long piston stroke make the heavy, slow freight locomotive.

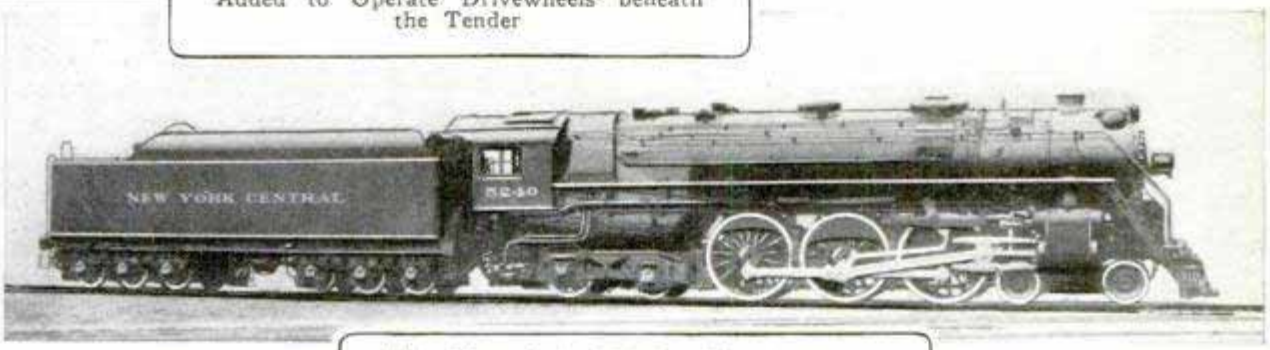
That is all a matter of formula. You can design a locomotive to go as fast or pull as much as you like, if at the same time you can design a boiler that will supply enough steam to feed the cylinders. But in operation, both speed and power are limited by the steaming capacity. Un-



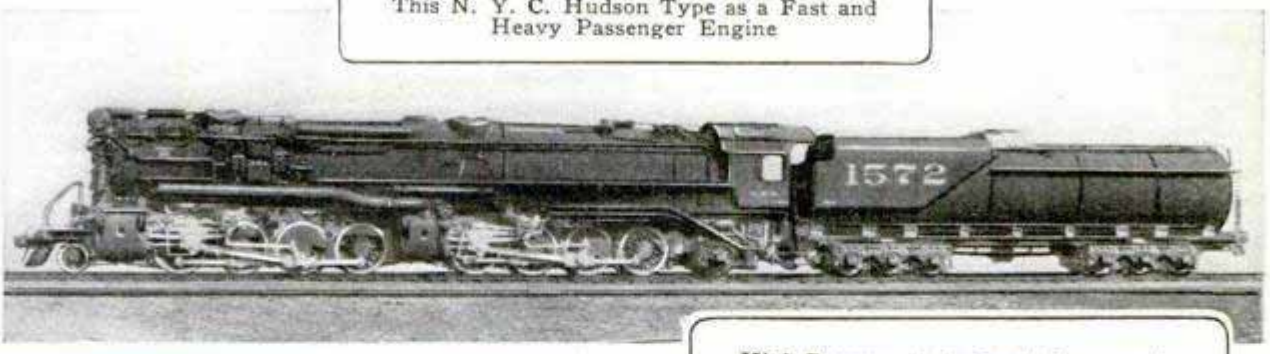
A Giant 2-10-10-2 Whose Four Cylinders and Twenty Drivewheels Pull Coal Trains over the Mountains



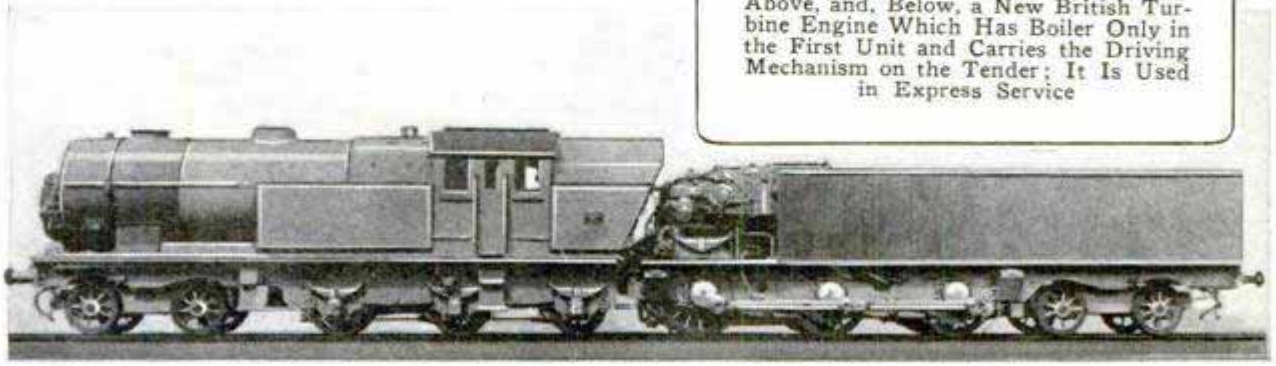
Here Another Pair of Cylinders Has Been Added to Operate Drivewheels beneath the Tender



The Size of the Driving Wheels Stamps This N. Y. C. Hudson Type as a Fast and Heavy Passenger Engine



High-Pressure Articulated Locomotive, Above, and, Below, a New British Turbine Engine Which Has Boiler Only in the First Unit and Carries the Driving Mechanism on the Tender; It Is Used in Express Service



der severe conditions, the boilers do not produce enough steam to keep the cylinders filled. Such locomotives are muscle-bound.

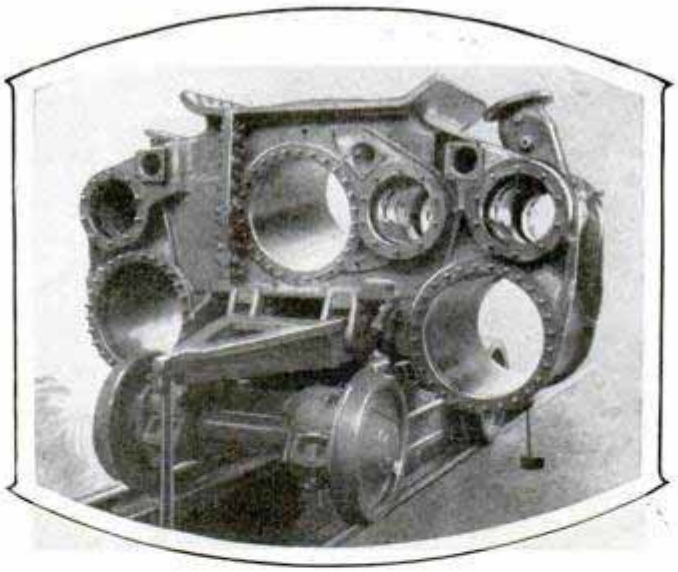
The newest locomotives embody the results of the designers' efforts to make the iron horse more powerful. Amazing increases in efficiency have been obtained by the simplest devices, which give added boiler power without increasing boiler size. They can be briefly enumerated as follows:

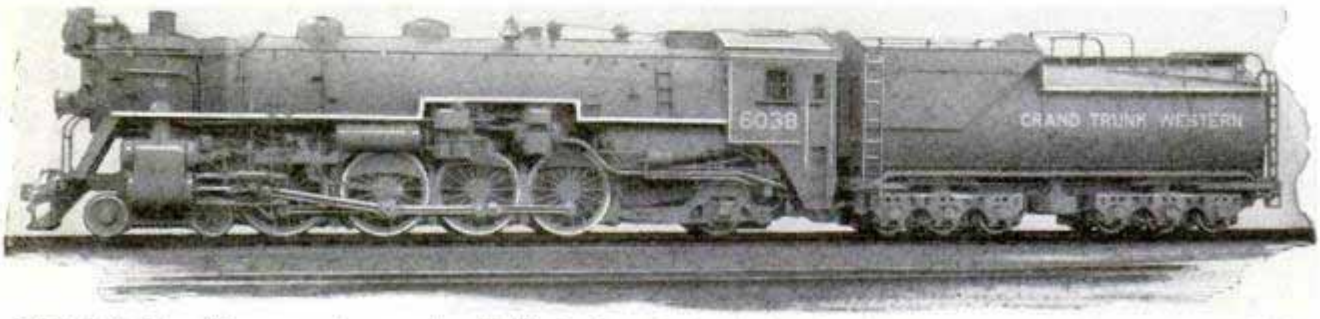
Increasing the locomotive boiler pressure, use of superheating devices to increase the temperature of the steam, devices to heat the tender water before it goes into the boiler, and increasing the size of the fire box and the area of the surfaces exposing water to be transformed into steam.

The capacity of a locomotive is proportional to its boiler pressure. With a pressure of 100 pounds, for example, an engine may develop 38,100 pounds tractive pull. At 200 pounds' pressure it will develop a tractive force of 76,200 pounds—twice as much. Until very recently only a few American locomotives had more than 200 pounds' boiler pressure. But recently a number have been built with boiler pressures of 250 and 265 pounds. One railroad is experimenting with two specially built designs having pressures of 350 and 400 pounds. In Germany experiments are under way with one engine with a boiler pressure of 850 pounds, at a fuel saving of forty-five per cent. When satisfactory methods are found to strengthen the boilers to withstand the bending force of the extremely high pressures, we will have locomotives that are reduced in size, yet more powerful.

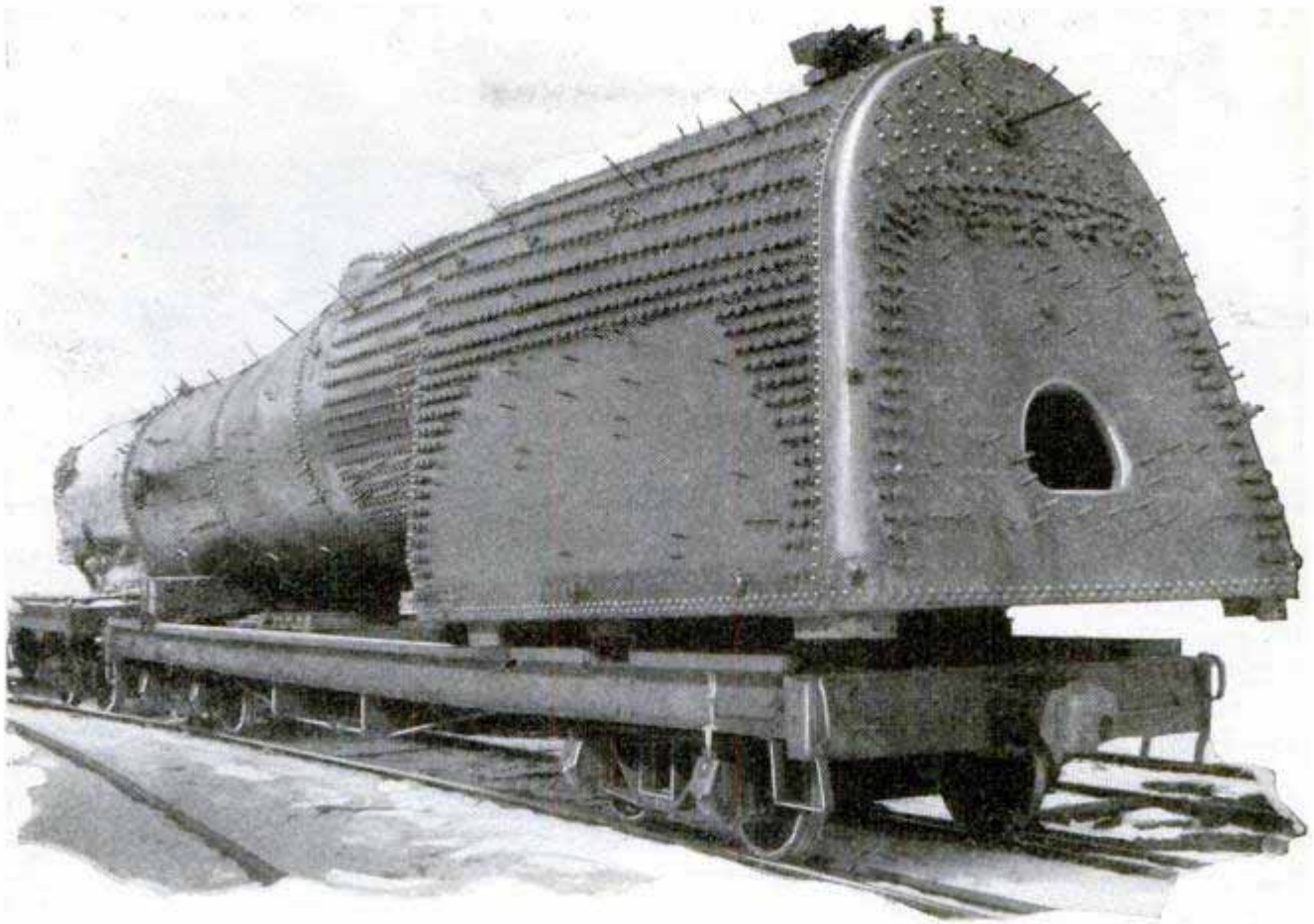
Superheaters, also developed in Germany, are not yet generally used in America, although most of the newly built locomotives have them. It is a property of steam that the higher its temperature the more rapidly it expands. Steam under 200 pounds' pressure, when superheated 200 degrees, increases approximately one-third in volume. The importance of this is the saving in steam, as two pounds can do the work of three. The superheater can add from fifteen to fifty per cent to a boiler's capacity, depending on the pressure and the degree of superheat.

Twenty-five per cent of the heat energy created in the locomotive fire box goes up the smokestack. Part of this waste heat is used to superheat the steam before it is led into the cylinders. Another source of waste is the exhaust steam. This exhaust is used to heat the tender water before it flows into the boiler, where it is turned into steam more rapidly, and thus the feed-water heater also has the effect of increasing the boiler capacity of the locomotive. Yet a check-up a few months ago showed that fewer than 5,000 of the steam locomotives





Mountain-Type Passenger Locomotive, Built in Canada for the National Railways; and, Above, Three Cylinders and Their Surrounding Parts Cast in a Single Unit



Locomotive Boiler and Fire Box Loaded on Two Flat Cars; the Mammoth Engines Used Today Require Enormous Fire Boxes, to Provide Heating Surface for Sufficient Steam Making

in use in the United States were equipped with feed-water heaters.

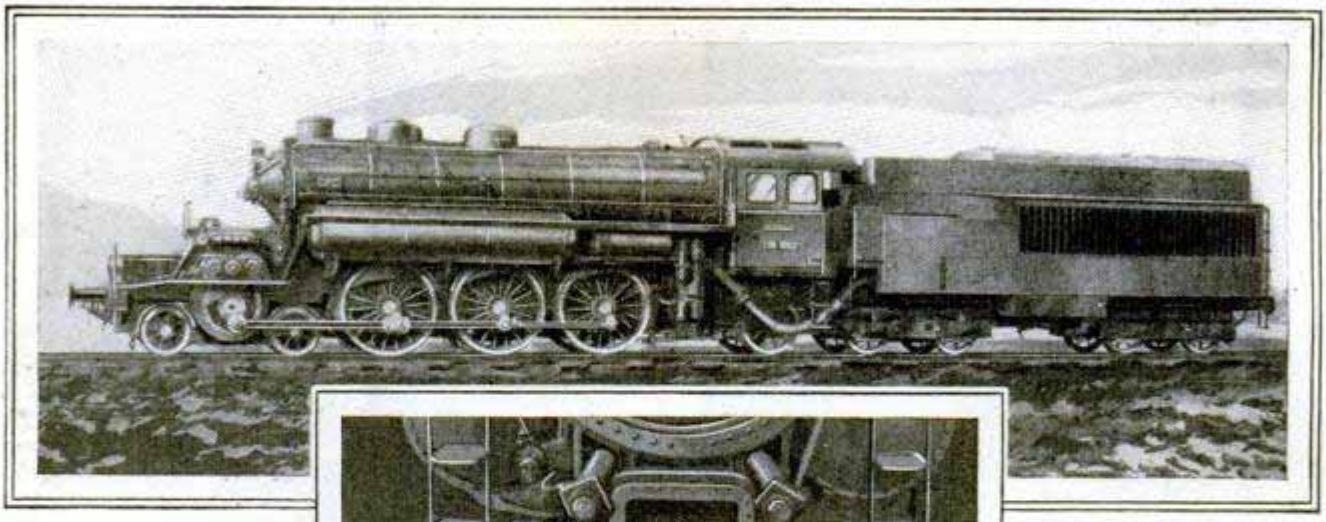
That further increases in boiler efficiency of locomotives will be made in the next few years, as higher pressures are made practicable and improvements are made in the superheating devices, designers are certain. In fact, they admit they must exhaust the possibilities of improving the old iron horse or see him become obsolete. Competition has forced steam-locomotive builders to make radical innovations in their engine designs.

Forty years ago when the first electric trolley line was successfully operated, the president of one of the country's largest railroads predicted that the steam locomotive would disappear within twenty-five years. The automobile has almost driven the trolley lines out of business, but the iron horse still rules the rails.

Now the steam locomotive is beset by several rivals. Between 1900 and 1920, the number of steam locomotives grew from 37,000 to 69,000. Now there are not more than 64,000 iron horses in service. They face a real fight to survive, for the past few years have brought amazing developments. Tremendously powerful electric locomotives have supplanted steam on long stretches of roadway. Europe is developing the Diesel-type of internal-combustion locomotive which can be operated much more cheaply, and the steam-turbine locomotive, which can cover 450 miles without refueling. There are gasoline-driven locomotives, storage-battery locomotives and one that operates on a charge of live steam.

These new developments, all past the experimental stage, explain why the number of steam locomotives in service has shrunk from 69,000 to 64,000 in the last few years. In light-traffic work on American railroads, there are already in service nearly 500 gasoline-electric cars, some capable of pulling several trailers. Thousands of coaches are in operation, chiefly in suburban service, in multiple-unit trains; that is, each car receives electric power from a trolley to operate dynamos on the axles.

In the face of these remarkable developments, it does not require great courage to predict once more that steam is nearing the end of its usefulness on the rail-



New German Turbine, with Water Condensers in the Tender; Below, the Geared Turbine with Cover Removed

roads, that the newer, more powerful and more cheaply operated rivals will send the iron horse to the scrap heap. Such a prediction would be safe if the steam locomotive had reached the limit of its development. But, surprising as it may seem, after a hundred years of lethargy so far as real development is concerned, steam is at the threshold of infinite possibilities.

As a practical indication of what has happened, consider the fuel economies of the last few years. In 1923, the average coal consumption of passenger locomotives was 18.4 pounds for each "passenger-car-mile." In 1926, this had been reduced to 15.4 pounds, a saving of sixteen per cent. Over the same period, the fuel consumption of freight locomotives was reduced from 163 pounds to 130 pounds in hauling a 1,000-ton train one mile, a saving of twenty per cent.

The real significance of these figures is lost in the fact that they are averages. As the older locomotives are replaced with the modern type, with superheaters, feedwater heaters, and gradually increasing boiler pressures, the present well-founded charge of excessive cost of operation will no longer be possible. Much of the wasteful use of fuel by steam locomotives has been due to unwillingness of railroads to modernize their locomotives with the various economy devices because of the initial cost. When tender coal cost a dollar or two a ton, the voracious appetite of the old-fashioned iron horse was not a serious drain on the railroad purse. Now, when it costs around $5 to put a ton of coal in the tender, the saving of coal is vital.

In the three-cornered fight between steam, electricity and the internal-combustion motor, the important consideration, from a railroad standpoint, is flexibility of operation under all conditions. The great electric locomotives may be more useful on steep grades, but the electrics have this drawback. They lose power rapidly as speed is increased. While the Diesels operate cheaply, they are still too heavy for all-around work. The Diesel weighs, as a rule, around 275 pounds for each horsepower developed. The steam locomotive weighs on an average not more than 220 pounds.

Considerations such as these will determine what sort of motive power will be used on the railroads of the future. Another factor, neither mechanical nor practical, operates in favor of steam. The railroads are poor, many near bankruptcy. They cannot get the money to electrify their roads or to purchase improved types of locomotives. Therefore, of necessity, they must continue to use steam. They cannot scrap billions of dollars' worth of steam locomotives just because they are more expensive to operate.

This may not be sound economy. Then

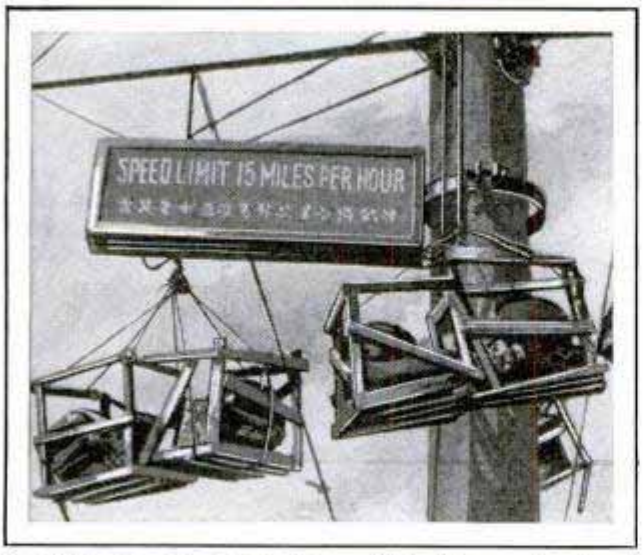
again it probably is, because the railroad operators and the locomotive builders realize they must make the iron horse do more work and cut his feed bill. The field of development—higher pressures, cut-offs, feed-water heaters, superheaters and improved design—is still practically untouched. The iron horse is steaming into a marvelous age.

EGYPT'S MUMMY FLUID USED FOR MOVIE FILMS

One of the "mystery" fluids, used by the Egyptians in preserving their mummies, is now employed in the manufacture of motion-picture film. It is an acid, obtained from waste wood. Certain derivatives of the substance enter into the making of the film. Its preservative qualities are due chiefly to the presence of wood alcohol and creosote. The old Egyptians prepared it in much the same way as it is now obtained, by heating wood to a high temperature in an inclosed chamber and condensing the vapors.

HUMAN HEADS WARN SPEEDERS TO OBEY TRAFFIC LAWS

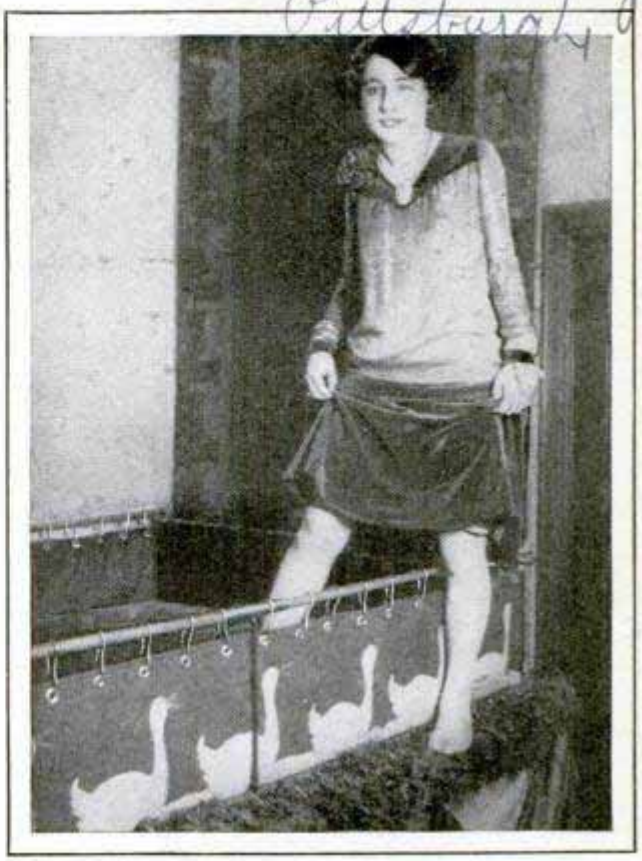
Motorists in certain parts of Pekin, China, are visibly reminded that the speed limit is fifteen miles an hour, by means of grim warning signs at various street intersections. Hung with the legend, which is written in English and Chinese, are boxes



In Pekin, Heads of Chauffeurs Who Violate the Speed Laws Are Cut Off and Exhibited as a Warning

containing the heads of chauffeurs who have violated the speed laws.

PORTABLE WADING POOL IS NEW PLAYROOM JOY

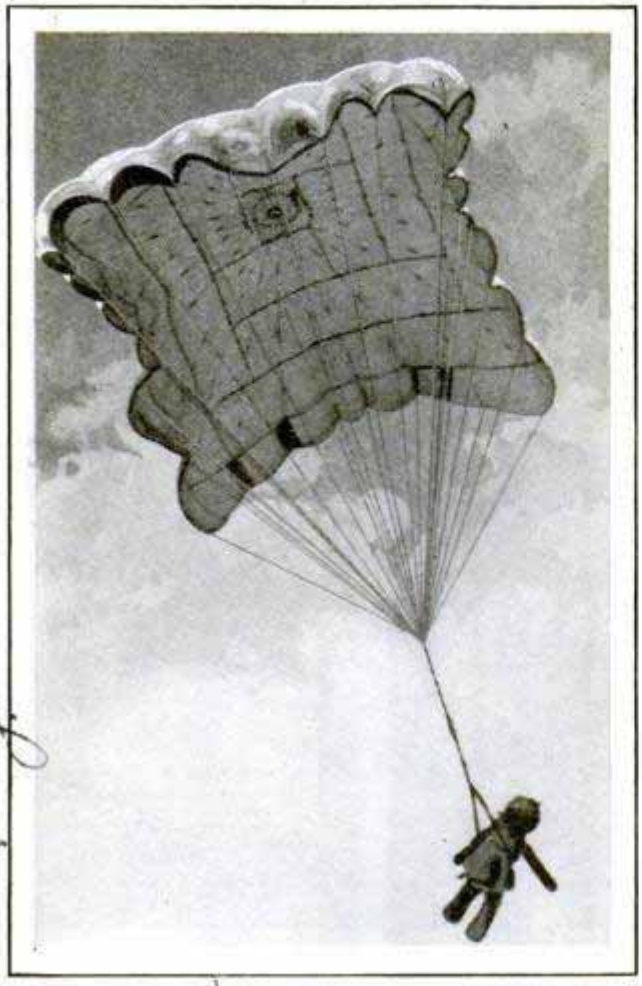


Demonstrating the Wading Pool for Playrooms; an Attractive Border Makes It Decorative

Expanding the idea of the canvas bathtub, a portable wading tank for the indoor playroom has been introduced. Water connection is made through the framework in somewhat the same manner as shower baths are attached to faucets. The tank can be stored in small space.

MANY USES FOR COTTONSEED BOOST CROP'S VALUE

Cottonseed and its by-products are employed in the manufacture of stuffings for cushions, mattresses and upholstery, for felt, clothing, and low-grade yarns, lamp and candle wicks, twine, rope, writing paper, explosives, artificial silk and leather, and photograph films, as well as for many other purposes. The hulls provide a source of potash and are also made into fertilizer, feed and fuel. It has been estimated that the seed adds about $500,000,000 annually to the nation's resources. Last year, more than 6,000,000 tons were crushed, yielding 2,000,000 pounds of crude oil, 3,500,000 barrels of refined oil and nearly 3,000,000 tons of cake and meal.



Testing the Square Parachute with Dummy at Lakehurst, N. J. These Canopies Are Easily Folded

SQUARE PARACHUTE IS TESTED FOR NAVAL AIRCRAFT

Experiments with a square-shaped parachute as a substitute for the usual type, have been conducted at Lakehurst, N. J. If the tests, which have been made with dummies instead of men, prove satisfactory, it is proposed to adopt this form for naval aircraft.

GAS ENGINE COOLS ITSELF WITHOUT WATER

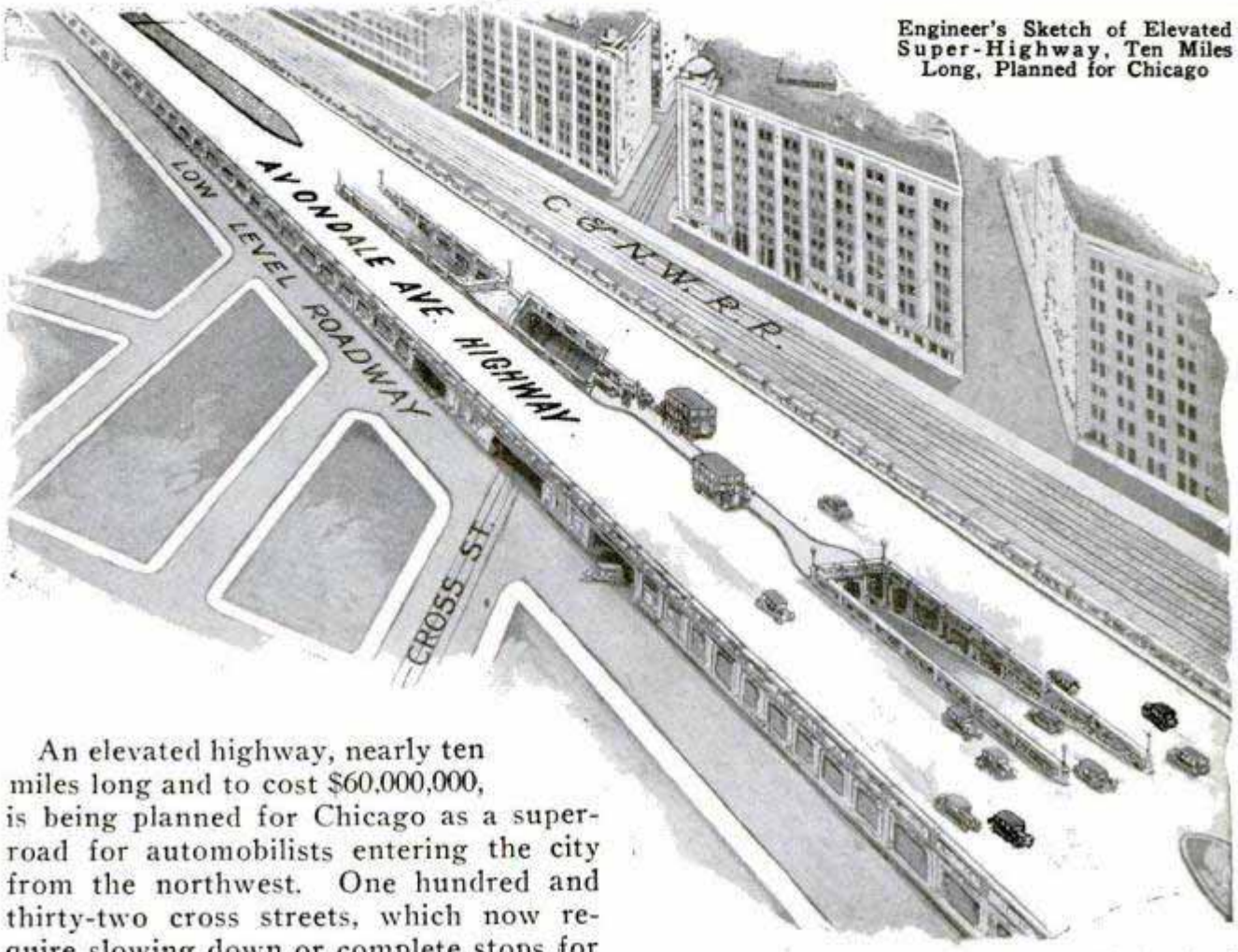
A gasoline engine with no visible means of cooling, because it uses a "refrigerating stroke" to dissipate the heat from the cylinder walls, has been demonstrated in England by a New Zealand inventor. It is claimed to recover a large part of the energy wasted in the cooling water of an ordinary engine, and to put the reclaimed heat to useful work, thereby saving fuel. The motor is a four-cycle engine, in that there is only one firing stroke per cylinder for each two revolutions of the crankshaft, but it is actually divided into five phases, instead of four. On the intake stroke the inlet valve is open for but half of the downward stroke. The valve then closes, and the gas mixture which has been sucked into the cylinder is expanded, as the stroke continues, until a partial vacuum of ten pounds less than atmospheric pressure is reached. The gases are thereby cooled, in accordance with a well-known thermodynamic law. As their temperature drops, they absorb the heat of the previous power stroke from the cylinder walls. On the compression stroke, owing to the absorbed heat, the temperature is considerably higher than usual, and the compression ratio is also much higher. Ratios as high as twenty to one have been used in the test motor.

RACER FOOT CAR FOR CHILDREN LATEST ROADSTER NOVELTY

Youngsters on the Riviera have been enjoying rides on racing roadster cars that they can pedal at considerable speed. Instead of the usual type of body, these have a flat board installed edgewise and painted with the characteristic lines and markings of the hood of a racing automobile. The car is equipped with a lightweight chassis and slender wheels for fast travel.

Child's Racer Car Reflects the Slender Streamline Patterns of the Fastest Automobiles and Is Equipped with Realistic Steering Wheel

ELEVATED SUPER-HIGHWAY TO COST SIXTY MILLION



Engineer's Sketch of Elevated Super-Highway, Ten Miles Long, Planned for Chicago

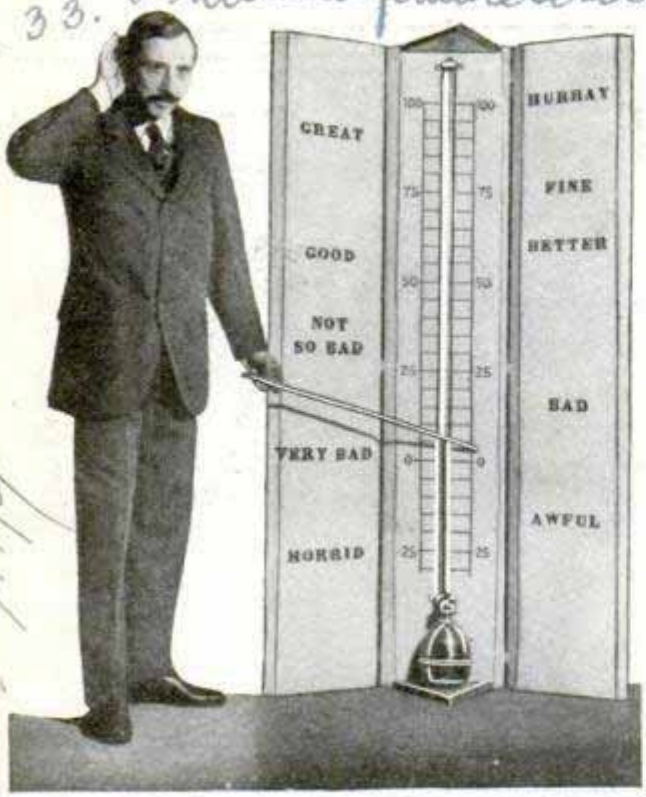
An elevated highway, nearly ten miles long and to cost $60,000,000, is being planned for Chicago as a super-road for automobilists entering the city from the northwest. One hundred and thirty-two cross streets, which now require slowing down or complete stops for opposing traffic, will be eliminated, while central ramps will accommodate twenty-three feeder streets, distributed at regular intervals. The super-highway will start at the northwest corner of the down-town loop district, where it will connect with a double-decked boulevard along the north bank of the Chicago river. The roadway will be 160 feet in width throughout its length, and will cut three miles from the distance now traveled to reach the country highways which branch out fan-wise to the northwest. It will have a capacity of 250,000 vehicles a day, and will connect with 300 miles of paved highways which serve 1,100 square miles of northern Illinois and southern Wisconsin.

FERTILIZING FISH FARMS

Just as the value of fertilization and cultivation of the soil has long been recognized, so "water farmers"—those who raise fish—are coming to realize the importance of adding fertilizing materials to the ponds. At the Fairport, Iowa, biological station, a marked increase in the yield was noted after a mixture of superphosphate and other materials was added to the water. It has also been found that certain small fish, on which such species as the black bass feed, can be grown in greater numbers by supplying them with an abundance of vegetable matter and other substances which the bass will not consume, but which the smaller fish will devour greedily.

ELECTRIC KETTLE HAS WHISTLE TO PREVENT OVERHEATING

When water boils in an electric kettle now on the market, a whistle blows as a signal that the current can be shut off and waste avoided. The device also prevents overheating the element and reducing its life.



Performance Thermometer for Training Chorus; It Shows When the Singing Is Good or Bad

CHORUS "SONG THERMOMETER" STIMULATES SINGERS

To encourage chorus singers to better performances, a special "thermometer" register has been devised by an eastern conductor. It shows whether the singing is good or bad by means of a red fluid that moves up or down in a large tube. The flow is regulated by bellows operated by the foot of the leader's assistant and the gauge tells the chorus what the conductor thinks of their efforts without his speaking to them. The device is said to be especially effective in rehearsal work.

STICKY TAPE ON ERASER LIFTS TYPEWRITER LETTERS

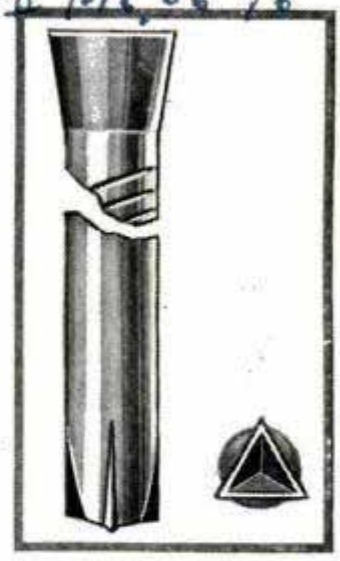
Sticky fabric instead of rubber is the chief feature of a typewriter eraser that literally pulls the letters off the outside page without disturbing the carbon copy below it. The fabric is held in a conveniently shaped reel which is applied to one letter at a time. Slight pressure and then a quick jerk obliterate the typing. The tape is rolled up as it is used, so that a fresh surface is always available, and replacement rolls of it are supplied for the reel.

NEW YORK-VERMONT BRIDGE TO SERVE MOTORISTS

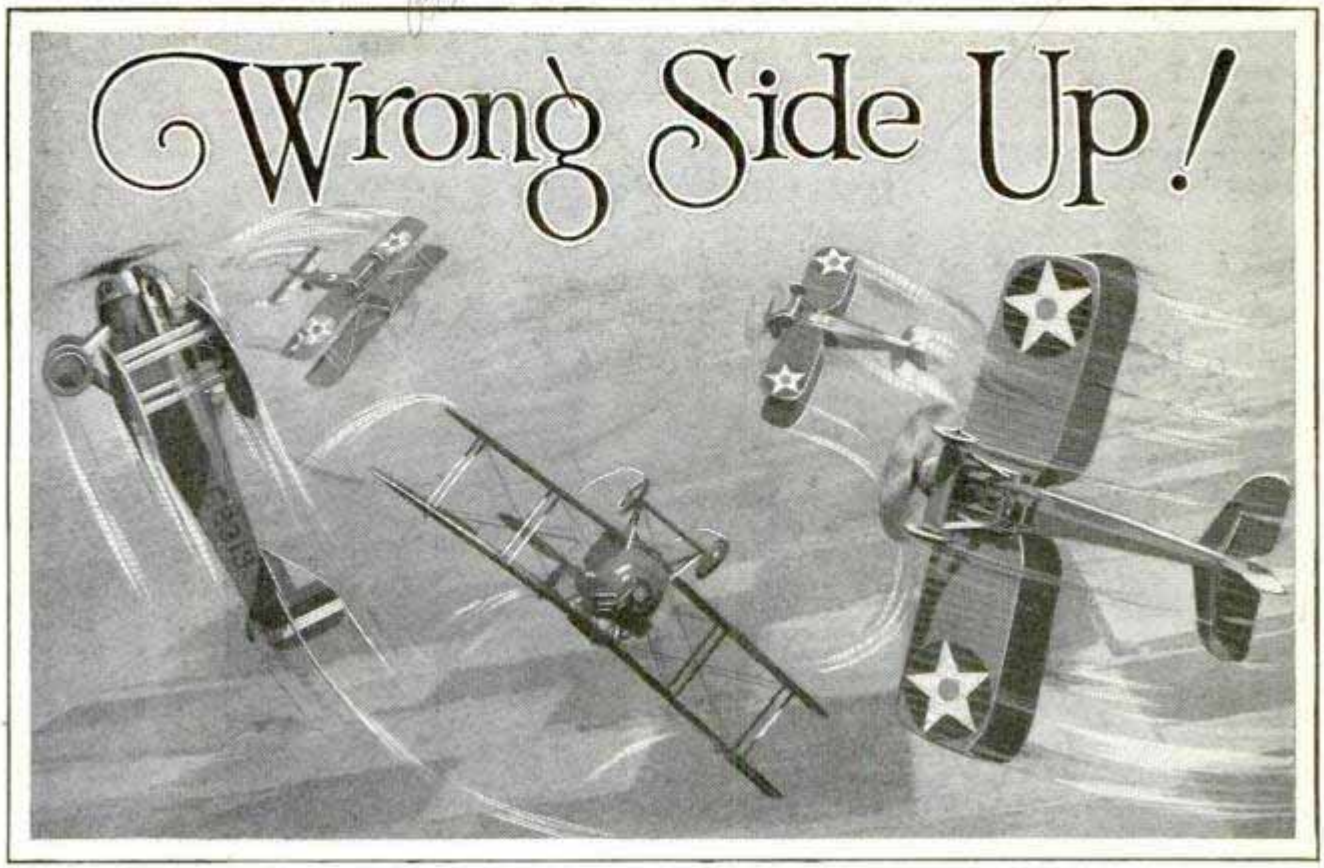
Motor routes between the Adirondacks and the Green mountains will be shortened from fifty to 150 miles by a $900,000 bridge to be built across Lake Champlain, linking New York and Vermont. It will also mark sites important in American history, for, at the New York end, are forts Frederick and Amherst. The former was built by the British and captured by the French in the French and Indian wars. Fort Amherst was taken from the British by Ethan Allen's Green Mountain Boys, was recaptured by the former and then abandoned after the battle of Saratoga. It was here that Benedict Arnold set forth with a fleet to defeat the British on the northern end of the lake. The bridge will be 2,190 feet in length.

NAIL THAT WON'T SPLIT WOOD HOLDS MORE FIRMLY

With a triangular tip instead of a sharp point, a nail, devised especially for use in packing crates and boxes, will not readily split the wood and is said to bind more firmly than the usual kind. The ordinary nail acts as a wedge as it enters, often forcing the fibers apart to the extent of splitting them. The triangular-tipped nail functions more like a punch and gives the wood more surface against which to hold. Tension is spread around the nail instead of in just two directions, as is the case with the common variety, which enters the wood like an ax.



Wrong Side Up!



Composite of Five Photographs of U. S. Army Planes, Looping, Rolling and Doing Immelmann Turns; "Aerobatics," or Aerial Acrobatics, Are Essential in Every Pilot's Training

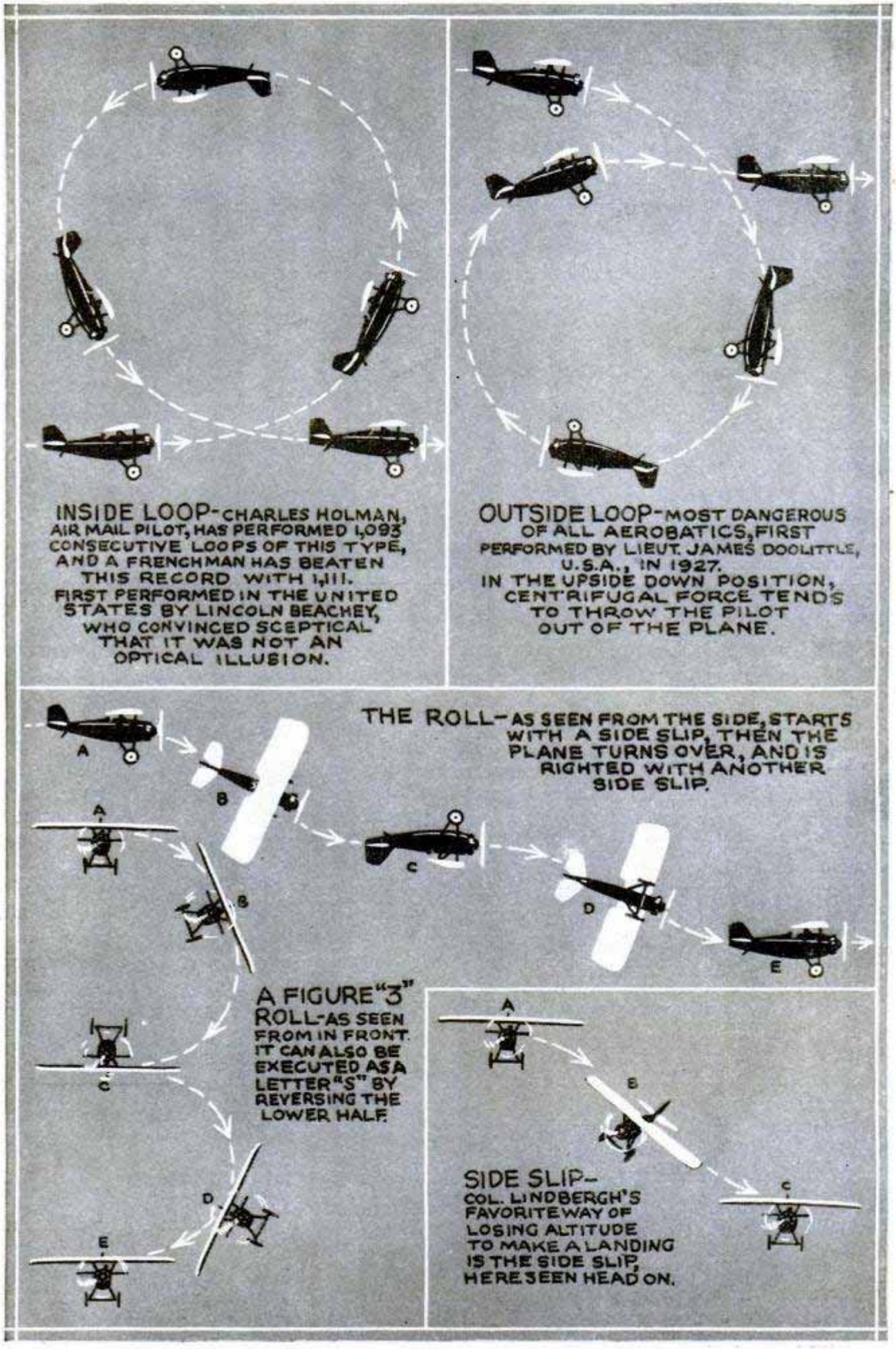
GERHARD Fieseler, the German stunt flyer, recently announced the perfection of a vertical figure 8. To the non-flyer that doesn't sound exciting, but ask a skilled stunt pilot what he thinks of it. Major Reed Landis, famous war-time ace, who knows as much about aerial acrobatics as anybody in the country, exclaimed, "Marvelous!" when he heard the news of the feat.

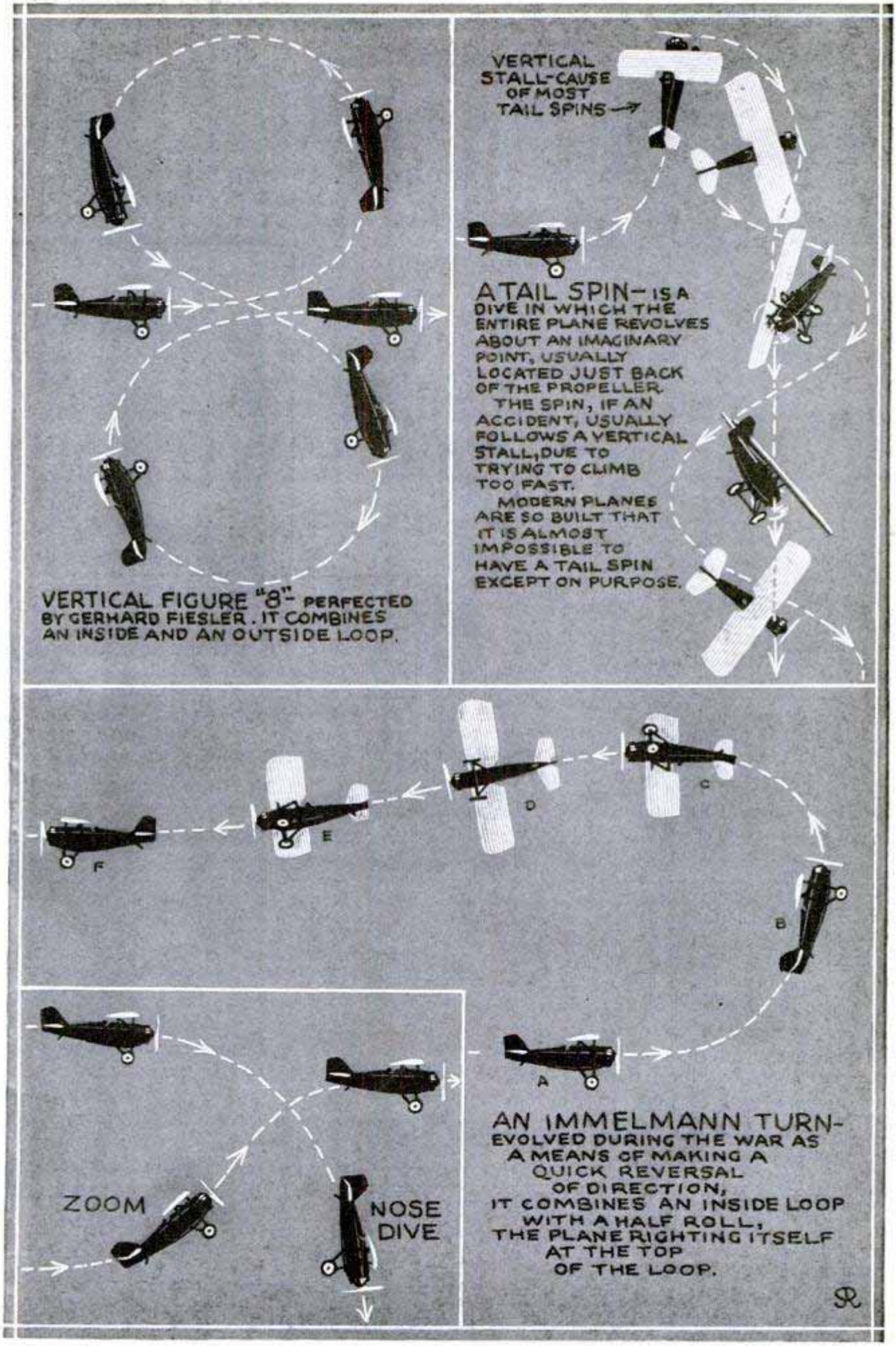
For a vertical figure 8 is a combination of an inside and an outside loop, and it has been less than a year since Lieut. James Doolittle, U. S. A., retired, performed the first outside loop in the history of flying, and came down with his eyes popping out of his head as the result of the terrific strain. Lieut. Doolittle, who can turn vertical banks around a race pylon steeper and tighter than anyone else has been able to turn them at high speed because his "insides" seem to be peculiarly constituted to resist the terrible centrifugal force involved, declared when he landed that he would never do an outside loop again.

Lieut. Al Williams, navy race pilot, recently tested a fast Curtiss Hawk pursuit ship in inside and outside loops, barrel rolls and other "aerobatics," carrying an accelerometer strapped to the wing to measure the strains on himself and the plane. The tests showed that, in an outside loop, the centrifugal force was so great that Williams' 200-pound weight increased to a thousand pounds, and the entire weight of the plane, about 2,100 pounds, was converted into 13,000 pounds as the ship swept through its circles at 200 miles an hour.

In an inside loop centrifugal force tends to keep the pilot in his seat. He doesn't even need to be strapped in, for he can't fall out any more than the adventurous souls who looped the loop on amusement-park rides twenty years ago could. In fact, an inside loop is performed just like the old carnival stunt, starting usually with a swift drop to get up speed, then a quick climb up and over the top, and another drop down the backside of the loop, followed by a level flight again. Yet it wasn't until November, 1913, that the late Lincoln Beachey performed a genuine inside loop in America, while the French flyer Pegoud did the first in the world on Sept. 13, 1913, at Issy, France.

An outside loop is just the reverse. If it is started with the plane flying right side up, the pilot first noses down, then


INSIDE LOOP- CHARLES HOLMAN, AIR MAIL PILOT, HAS PERFORMED 1,093 CONSECUTIVE LOOPS OF THIS TYPE, AND A FRENCHMAN HAS BEATEN THIS RECORD WITH 1,111. FIRST PERFORMED IN THE UNITED STATES BY LINCOLN BEACHEY, WHO CONVINCED SCEPTICAL THAT IT WAS NOT AN OPTICAL ILLUSION.
OUTSIDE LOOP- MOST DANGEROUS OF ALL AEROBATICS, FIRST PERFORMED BY LIEUT. JAMES DOOLITTLE, U.S.A., IN 1927. IN THE UPSIDE DOWN POSITION, CENTRIFUGAL FORCE TENDS TO THROW THE PILOT OUT OF THE PLANE.
THE ROLL- AS SEEN FROM THE SIDE, STARTS WITH A SIDE SLIP, THEN THE PLANE TURNS OVER, AND IS RIGHTED WITH ANOTHER SIDE SLIP.
A
B
C
D
E
A FIGURE "3" ROLL- AS SEEN FROM IN FRONT. IT CAN ALSO BE EXECUTED AS A LETTER "S" BY REVERSING THE LOWER HALF.
SIDE SLIP- COL. LINDBERGH'S FAVORITE WAY OF LOSING ALTITUDE TO MAKE A LANDING IS THE SIDE SLIP, HERE SEEN HEAD ON.


VERTICAL FIGURE "8" PERFECTED BY GERHARD FIESLER. IT COMBINES AN INSIDE AND AN OUTSIDE LOOP.
VERTICAL STALL-CAUSE OF MOST TAIL SPINS
A TAIL SPIN—IS A DIVE IN WHICH THE ENTIRE PLANE REVOLVES ABOUT AN IMAGINARY POINT, USUALLY LOCATED JUST BACK OF THE PROPELLER.
THE SPIN, IF AN ACCIDENT, USUALLY FOLLOWS A VERTICAL STALL, DUE TO TRYING TO CLIMB TOO FAST.
MODERN PLANES ARE SO BUILT THAT IT IS ALMOST IMPOSSIBLE TO HAVE A TAIL SPIN EXCEPT ON PURPOSE.
A
B
C
D
E
F
ZOOM
NOSE DIVE
AN IMMELMANN TURN-EVOLVED DURING THE WAR AS A MEANS OF MAKING A QUICK REVERSAL OF DIRECTION, IT COMBINES AN INSIDE LOOP WITH A HALF ROLL, THE PLANE RIGHTING ITSELF AT THE TOP OF THE LOOP.

Trailing a Streamer of Smoke, a Cabinet Plane Dives Out of the Clouds to Start a Dog Fight with Three Enemy Ships

pulls the plane back and under, climbs straight up, and then levels out again. Fieseler does it two ways, a downward and an upward loop. In the latter, he first rolls the plane over in a half-barrel roll until he is flying upside down, then noses upward as though for the usual inside loop, except, as he started from an upside-down position, he is on the outside of the circle instead of the inside.

It took weeks of studying of each separate movement before he perfected his vertical figure 8, performing it sometimes with the inside loop first, and again with the outside one at the top. In upside-down flying, the controls work in just the opposite direction from what a pilot is normally accustomed to, so that every step must be carefully planned in advance, and then practiced until it becomes automatic. Things happen so rapidly in the air that it is often difficult for an observer on the ground to say just what takes place. Before Beachey actually performed the first loop he had for months executed what, from the ground, looked like a loop, but, flying a mile high, he only put his plane through a steep vertical bank in a 100-foot circle.

When Pegoud announced his premier loop, and Beachey followed with his announcement, experienced flyers, including both Curtiss and Wright, claimed it was the same optical illusion, and it took several demonstrations to convince the doubting ones that a man really could fly upside down. The chief reason for doubting the loop was the theory that the engine would stop because the carburetor could not feed gas to the cylinders when the power plant was upside down. Beachey contended centrifugal force would carry him over the top of the loop, and the engine would then start again—and this idea proved correct.

The tail spin used to be one of the most deadly causes of flying accidents and considerable time was spent teaching new pilots how to avoid it, and how to get out of a spin if the plane should accidentally go into one. The chief requisite for getting out of a spin was plenty of altitude to maneuver in. With modern aircraft conditions have changed. Planes are built now which can't be made to spin without deliberate intent on the part of the pilot, and which will come out of a

spin by simply setting the controls in neutral. A few years ago a failing motor was the terror of flyers, because loss of flying speed almost invariably meant a tail spin. Similarly a dead-stick landing—one in which the motor is stopped either by accident or design—gave a real thrill. Several planes are built now which will practically fly themselves even after the motor is cut off; in fact, as they lose flying speed they will "pancake" toward earth on an even keel, without a hand on the controls.

Col. Lindbergh's favorite stunt is a side slip when landing. It offers a quick and spectacular way to lose altitude. Normally, a flyer approaches a landing field at a fairly good altitude, to give opportunity to look it over before coming down. To lose the altitude a few drop one wing so low that it ceases to support the plane, and then slip downward and sideways.

Two of the most popular war-time maneuvers, which aren't used much in ordinary commercial flying, are the barrel roll and the Immelmann turn, the latter named for the famous German pilot who invented it. The Immelmann turn offered a quick way to get out of trouble or to return to the attack after passing an enemy. The pilot simply pulled the nose of his ship up as though to do an inside loop, and then, at the top of the loop, dipped one wing and rolled the ship over in a half-barrel roll, so that, instead of flying upside down, he was right side up, but reversed.

The full-barrel roll involved a double turn. Lowering one wing in a side slip, the pilot kept on until he was flying upside down, and then by side slipping again, completed the evolution, either in the same direction, to produce a letter-S effect when viewed head on, or in the opposite direction, which produced a figure 3. With war-time planes, the roll involved some loss of altitude, but modern high-speed ships can be rolled so rapidly there is practically no dip, and some even can be rolled while they are climbing.

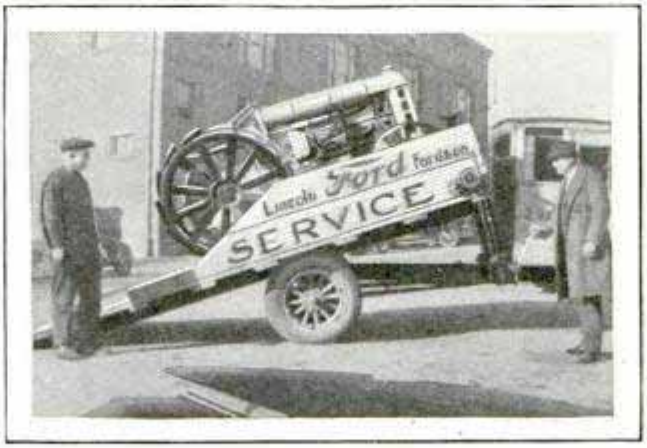
Vacuum Cleaner Rigged as a Sprayer for Furniture or Other Articles

SPRAYER ON VACUUM CLEANER —SAVES HAND PAINTING

Painting your automobile, furniture or walls with a vacuum cleaner, sounds fanciful, but that is essentially what is done with the aid of a sprayer attachment easily fitted to the cleaner hose in place of the usual nozzle. It has an instantaneous shut-off and the air forced from the cleaner insures a thorough job of spraying.

TILTING AUTO-SERVICE TRUCK HELPS BRING IN WRECKS

For hauling tractors and disabled automobiles, a service truck devised by an Iowa garage man is equipped with a body that can be tilted up until the back rests on the ground. This facilitates loading. The movement is accomplished with the aid of a hoist at the forward end. The body is quickly returned to the normal plane after filling. A tractor can climb the truck under its own power.



Service Truck with Body Tilted for Handling a Tractor; the Same Arrangement Is Useful in Towing Wrecks

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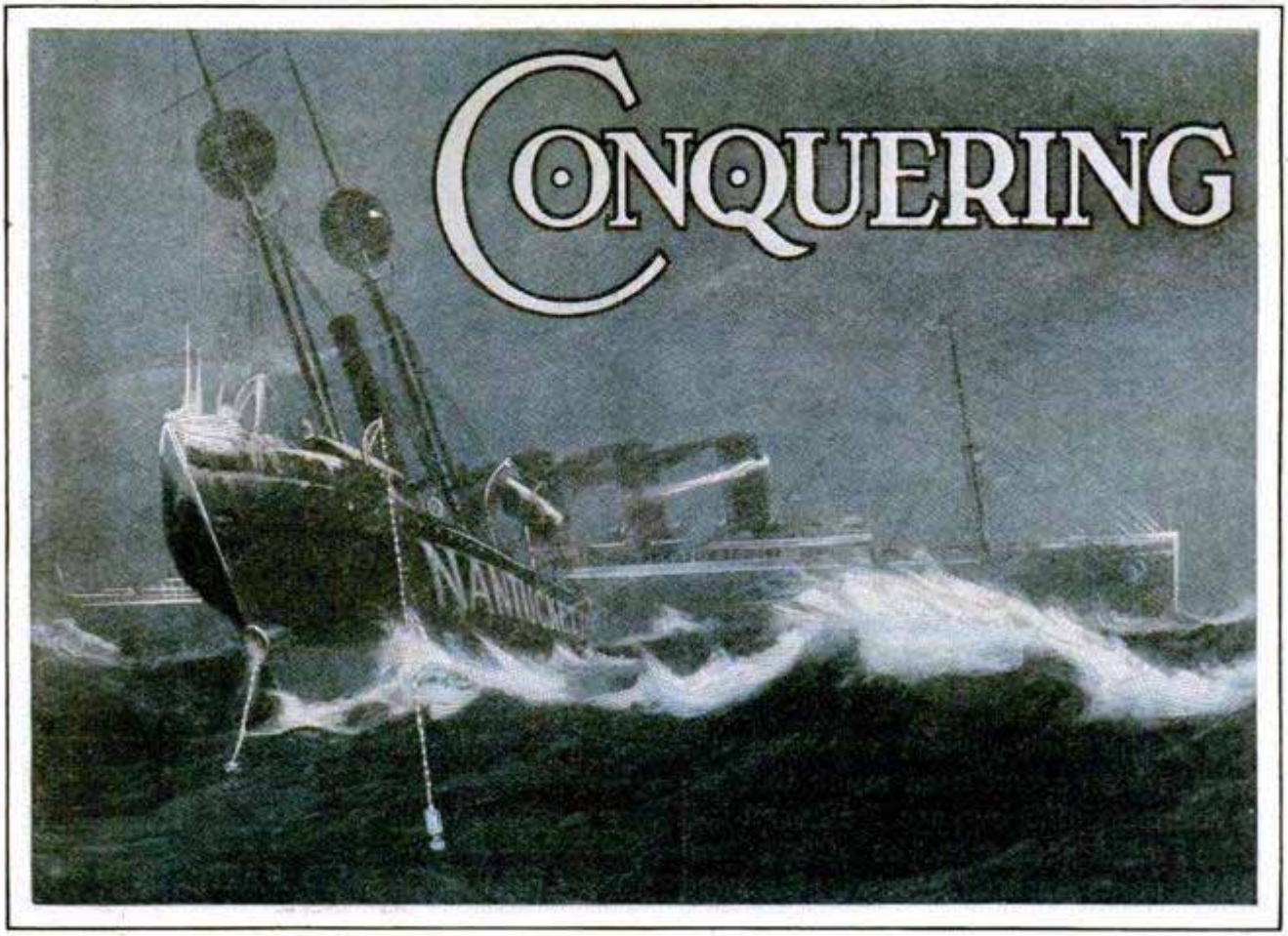


Suspended from a Lightship, the Submarine Bell Transmits Under-Water Warning Signals When Fog Is So Thick That the Light Overhead Cannot Penetrate It

A GREAT liner, ablaze with lights, is ready to sail from New York, to Europe bound. The hour is midnight, when a dozen little tugs snake the towering ship out of the pier slip. Electric telegraphs, scattered over the ship, transmit orders back and forth between the chief of the tug captains and his aides, directing the operations.

Well clear of the rows of piers along the shore, the tugs back away and allow the huge ship to swing toward the sea. Engine-room telegraphs sound their warning bells to stand by, followed by slow ahead and then half speed. With hardly a sound, the big ship slips away down the river, a moving mountain of blazing lights.

On the bridge, the harbor pilot calls an occasional order to the quartermaster at the wheel. As the Narrows are reached, an officer dons a radio headset and takes over the task of conning the big vessel down the channel, guided by electric messages from a cable stretched along the sea bottom.

Outside of Sandy Hook, a boat picks up the pilot, the ship squares away for the run to the Grand Banks, and on the bridge the course is set on "Metal Mike," the current turned on—and a mechanical man takes over the ship. His quartermaster attendant stands by to see that the electric steersman works properly and doesn't run out of oil, but Metal Mike does the work.

That's the picture of sailing day, or rather sailing night, that makes the old-time skipper rub his eyes. In the last ten years navigation of the seas has been completely revolutionized. There is as much difference between the modern crack flyer of the north Atlantic and the fine old "St. Paul," "St. Louis" and other ships of thirty years ago, as there was between those cruiser-liners of Spanish-American war days and the sailing packets of a century earlier.

The old-time sailor who strained his eyes to pierce the murk and spray of a driving rain, snow or sleet storm is gone. His successor, warm and comfortable on a glass-inclosed bridge, glances through a whirling pane, kept free from snow and ice or raindrops by the speed at which it revolves. Or if he must go out on the

AGE-OLD SEA PERILS

"Metal Mike," Which Guides a Giant Liner without Human Help, Is Set with This Small Wheel

open bridge, he has another revolving window pane mounted in a hood, which protects his face and eyes while he swings it around the horizon.

Once ships felt their way along forbidding coasts and often brought up with sails aback while the deep-sea lead was hove to measure the water underfoot. Now the liner storms along at twenty-three to twenty-five knots, and if the officer on watch wants to know the depth of water under his keel, he turns, presses a button, and an invisible electric machine starts a sound producer on the outside of the hull, far beneath the waves, to send signals to the sea bottom, while another machine catches their echoes on the rebound. As the officer starts the apparatus, an indicating hand begins to turn, and when the signal returns, it lights a tiny electric lamp, while the reading of the hand gives the exact depth.

The seaman who served his apprenticeship in sail, or even in the best liners of a generation ago, learned to drive through fog and rain for days at a time, computing position from the course, the patent log, and dead reckoning, supplemented, in steam, by the engine revolutions. The modern sailor can do that too, but if he is within wireless range of land, he need only don a headset, reach overhead for a handwheel that turns a loop aerial, and tune in on a couple of distant radio-compass stations. When the loop points directly at the land station, the signals come at their loudest, and it is the work of only a few moments to take the compass bearings, lay them down, with parallel rulers and pencil, on a navigation chart, and where they meet, there the ship is.

One by one the perils of the sea are succumbing to inventive genius. There were the dangers of storm, of fog and of uncharted rocks; the perils of unfriendly lee shores, of passing ships, floating, waterlogged derelicts and wandering icebergs.

Sailors Laboring on Lofty Skysail Yards, and the Slow Task of Heaving the Heavy Deep-Sea Lead, Alike Are Disappearing from the Seas

And, on one's own ship, there was the ever-present peril of fire, the most dreaded danger of them all.

Ships themselves are fireproof, since the days of wooden vessels have passed, but the possibility of fire can never be eliminated so long as they carry fuel and inflammable cargo. Now, the modern liner, and the modern merchantman and yacht, too, have eliminated the peril by making it impossible for the fire to get a real start.

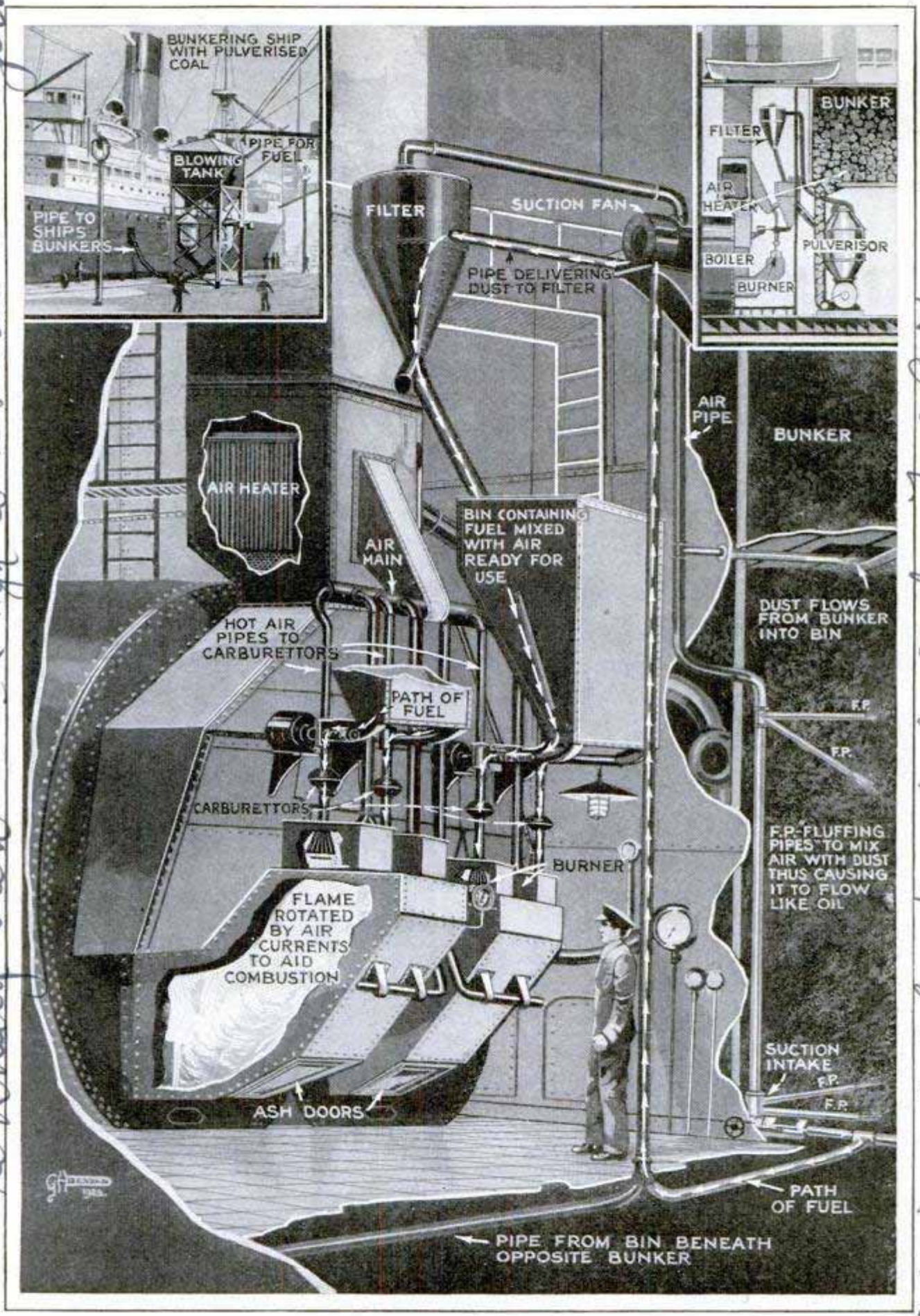
From the bridge the condition of every compartment in every section of the ship is constantly under control. Delicately sensitive electrical apparatus record every change of temperature in each part of the ship, and sound a warning if the temperature begins to rise. In some ships a system of piping leads from every compartment to a hull model of the ship, mounted behind glass, so that the air in each can be tested for smoke.

If fire does break out, a turn of a valve floods the compartment with a heavy, inert gas, which smothers the flames instantly, and the gas disappears within a few hours, leaving neither trace nor damage behind, so there is no loss from water.

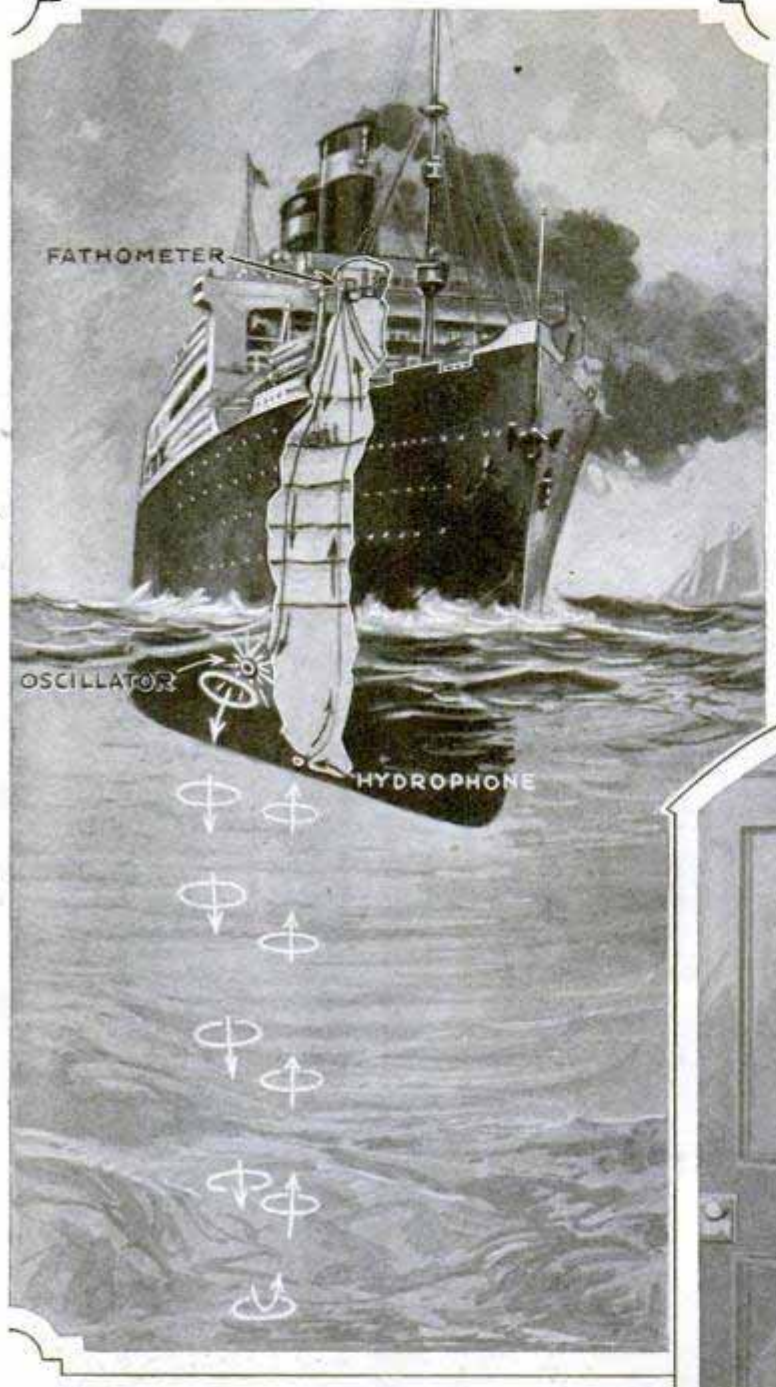
The international ice patrol, established after the "Titanic" disaster, has robbed the fog-shrouded reaches of the western ocean of much of the spring-time terror, for the coast-guard cutters ride herd on the southward-bound bergs and report each day the position of every one, until, in the warming influence of the Gulf Stream, it has melted down below the danger size.

Uncharted shoals and rocks, at least on all the regular courses, are things of the past. The ocean bottom is so well known that it is possible to compare the echoes returned by the "fathometer"—as the sea-depth indicator is called—with a chart made for the course and tell just about where the ship is.

But it is in the aids to navigation that the greatest advance has been made. Once storms swept up over the horizon and often tore the sails away in ribbons before the crew could smother the canvas into reefs. Now the liner at sea can get the weather map each day, drawn by an automatic radio-operated pen without the help of any human hand, the governing signals coming through the air with the speed of light, just as they are trans-



Even the "Black Gang" Has Been Replaced, First by Oil-Fired Boilers, Then by Diesel-Motor-Driven Ships, and Now, on One American Vessel, by Powdered Coal, Which Is Blown through Pipes and Burned like Oil; the Coal May Be Pulverized on Board, as Shown in the Large Drawing, or by a Plant Ashore, as in the Insert Sketch, and Then Piped Aboard

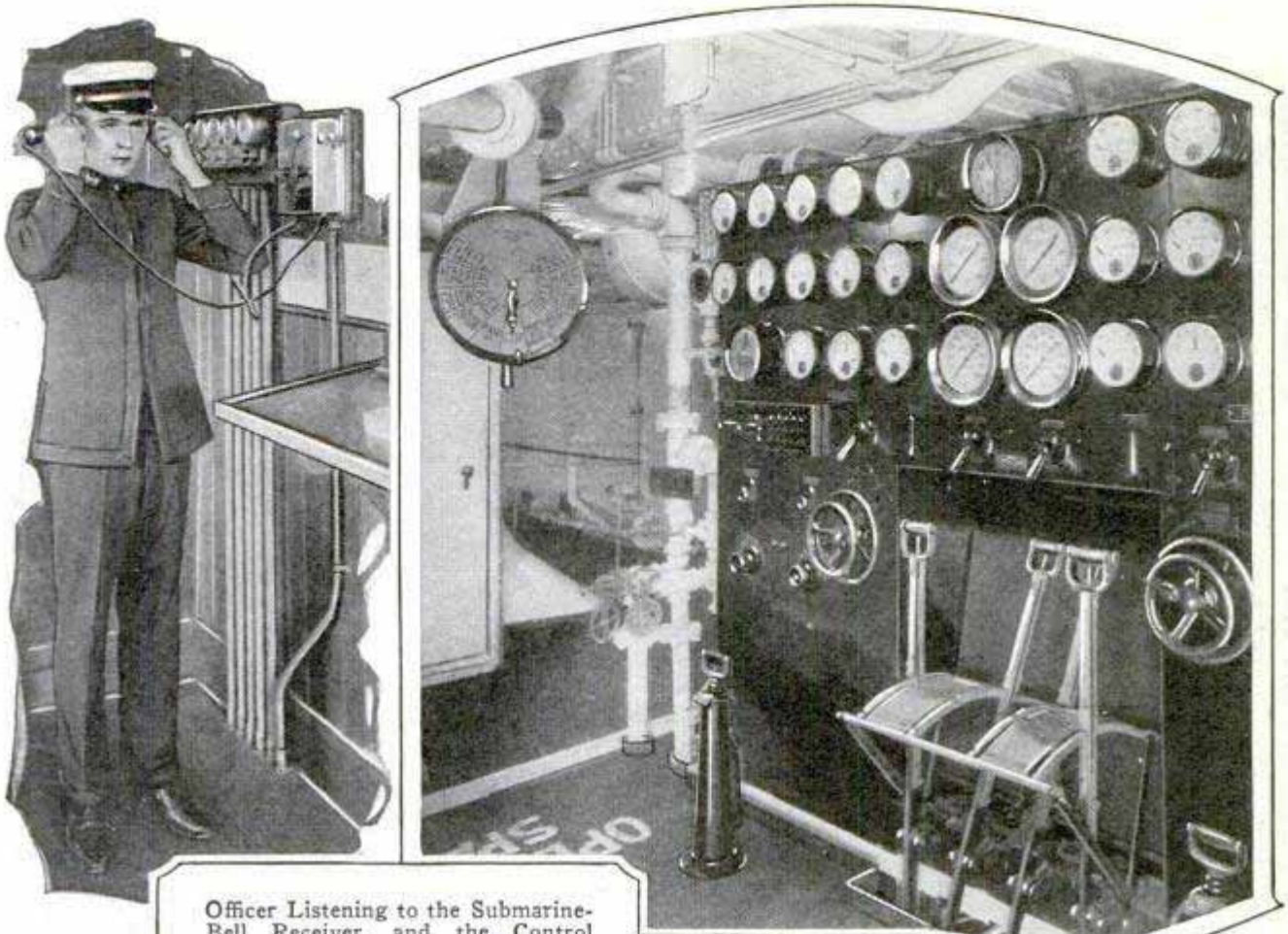


The Electric Sounder, Above, Has Replaced the Lead; at Right, the Indicator Which Shows the Sea Depth

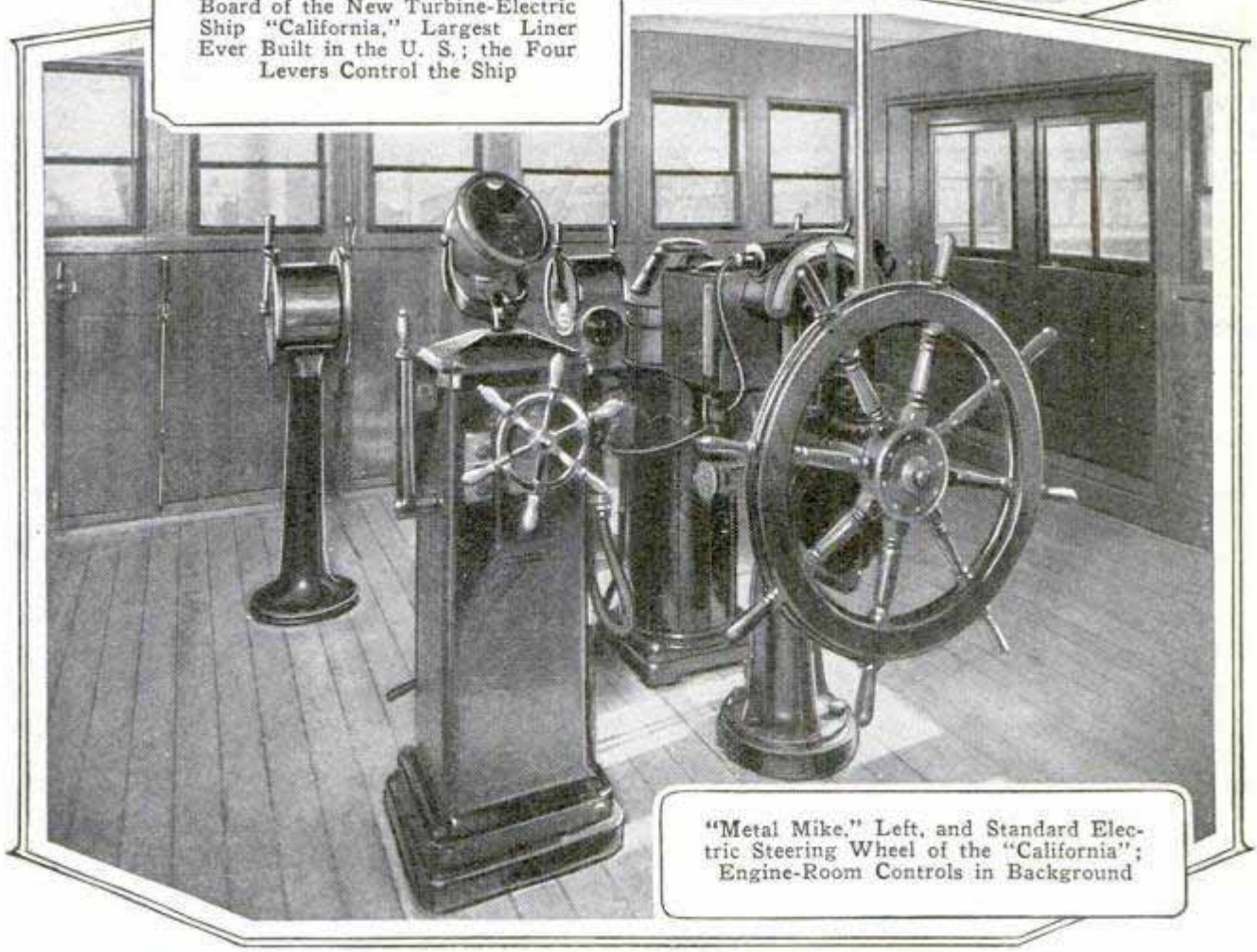
mitted from the naval station at Arlington, on the heights across the Potomac from the capital. With the weather maps for each day available, the navigator can trace the development of each cyclonic storm center as it sweeps across the country from west to east and so out to sea, or as it moves north and west across the middle Atlantic, turns northward along the coast, or up through the Atlantic states; or, in exceptional instances, circles over the middle west, before recurving out over the north Atlantic. Watching the advance of the storm, getting the daily radio bulletins on its progress and intensity, and the reports of other ships, he knows just when and how hard it will strike.

If he runs into fog, he knows, from his radio reports, whether there are icebergs ahead. His automatic fog siren sounds its regular warnings to the fishing boats that may lie in his path along the Grand Banks. Wireless and submarine sound detectors both keep check on other large vessels in the neighborhood.

The submarine sound detector is a story in itself, and, like many of the other new devices aboard ship, is an outgrowth of the intensive study of the submarine menace during the war. An automatic bell, under water on the ship's hull, sends out constant sound waves, to be picked up by listening electric ears, just as the ears of the ship will pick up the waves from the bells of others. Along the shore, similar bells are in use, transmitting their signals farther than a foghorn can send sound through the air—often farther than the best of the coast lights can be seen.

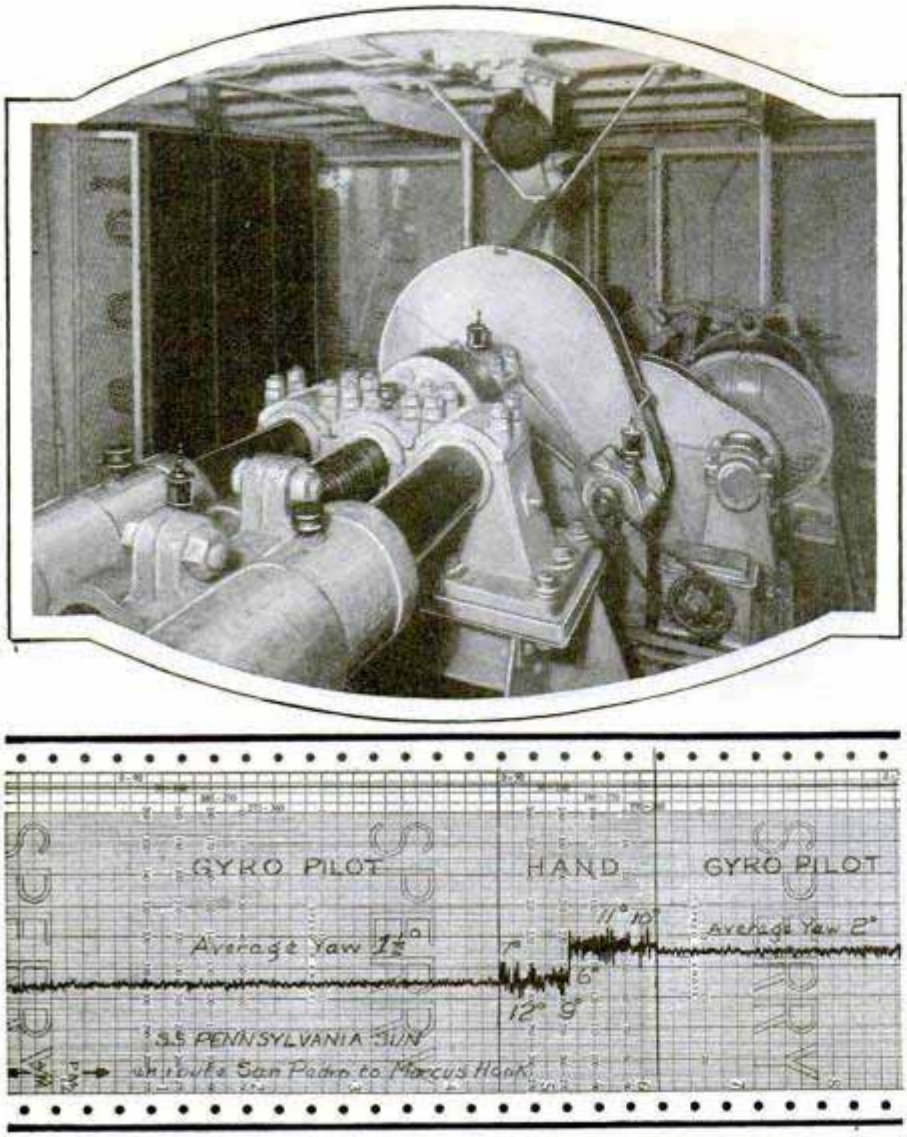


Officer Listening to the Submarine-Bell Receiver, and the Control Board of the New Turbine-Electric Ship "California," Largest Liner Ever Built in the U. S.; the Four Levers Control the Ship



"Metal Mike," Left, and Standard Electric Steering Wheel of the "California"; Engine-Room Controls in Background

Courtesy International Mercantile Marine



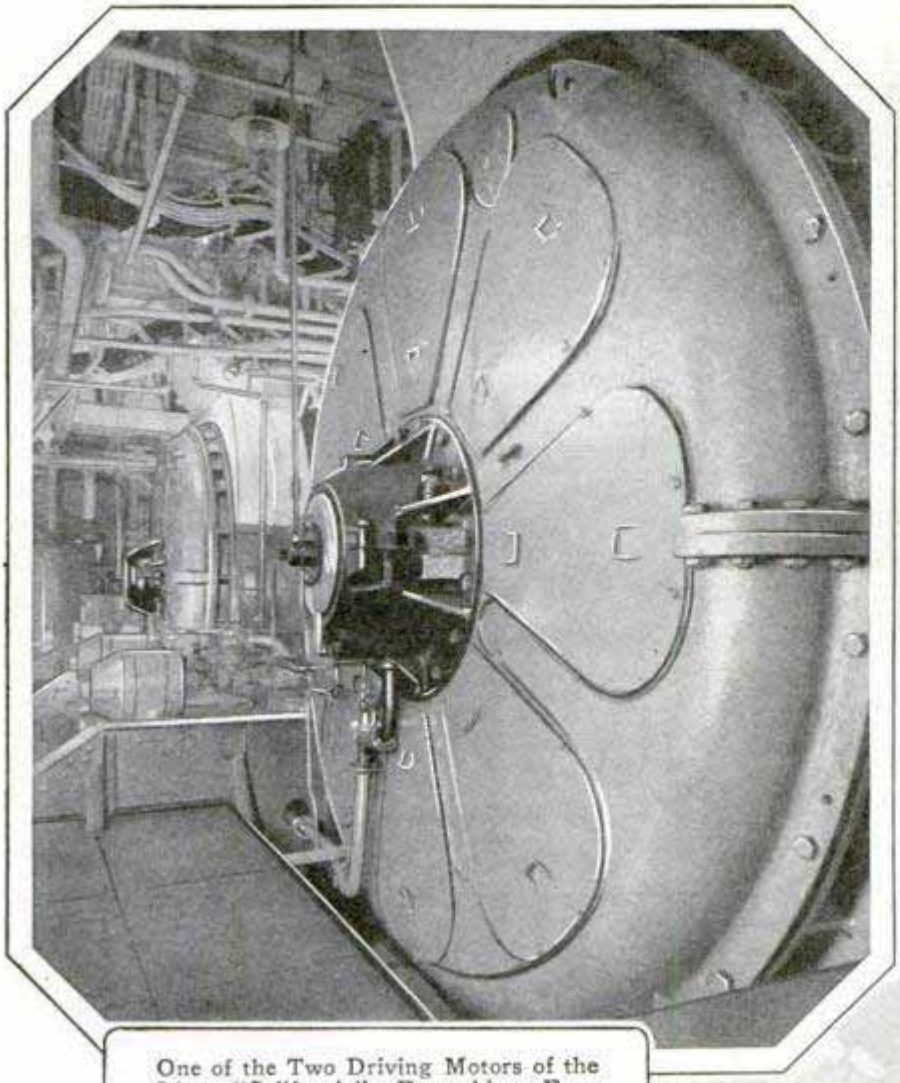
The Steering Engine, Operated by a Gyro Compass, and a Typical Steering Sheet, Showing the Tremendous Yawing While under Hand Control

Some experiments have been made to utilize the submarine-bell and fathometer ideas to detect icebergs by reflecting back sound from them, for a big berg, with the greater part of its bulk under water, extends to depths of several hundred feet. If these experiments, which have shown some promise, meet with final success, it is possible that other ships and particularly floating derelicts may be located, too, by echo. The derelict menace is always present, though the coast-guard cutters and a world-wide system of reports on navigation menaces, serve to reduce it. The cutters scour the seas to track down every derelict reported and either sink it by gunfire, blow it up with bombs planted in the hold, or tow it to port for salvage. Some of them are hard to destroy—a dismasted lumber schooner, for example—because, no matter how badly waterlogged they may become, their cargoes serve to keep them afloat. A liner speeding through the night at twenty-five land miles an hour can be badly damaged, should it strike such a mass.

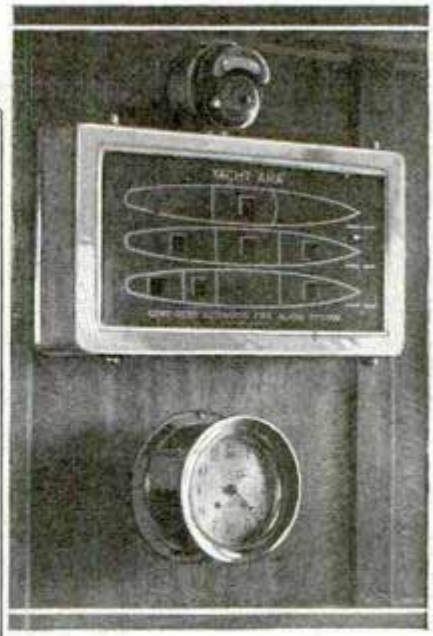
Another use for the submarine bell has been found in conjunction with automatic radio apparatus on lightships marking channels off important ports. Radio waves travel through the air with the speed of light, but sound waves traveling in water advance only 4,800 feet per second. Knowing that, the navigator need only measure the elapsed time between the receipt of a radio signal and a submarine signal, sent simultaneously, to figure how far he is from the sound source, on the lightship. At the same time, the radio direction finder gives the true bearing of the lightship, so it is possible to plot the liner's position on the chart with that single bearing, instead of requiring cross bearings from two radio stations to fix the distance from ship to shore.

The revolution in modern ships really started before the war, with the first application of gyroscopes to seagoing problems. Now there is the gyroscopic compass, "Metal Mike," the gyroscopic helmsman, and the gyroscopic stabilizer, that make a relatively small yacht or other ship ride as smoothly as a giant liner.

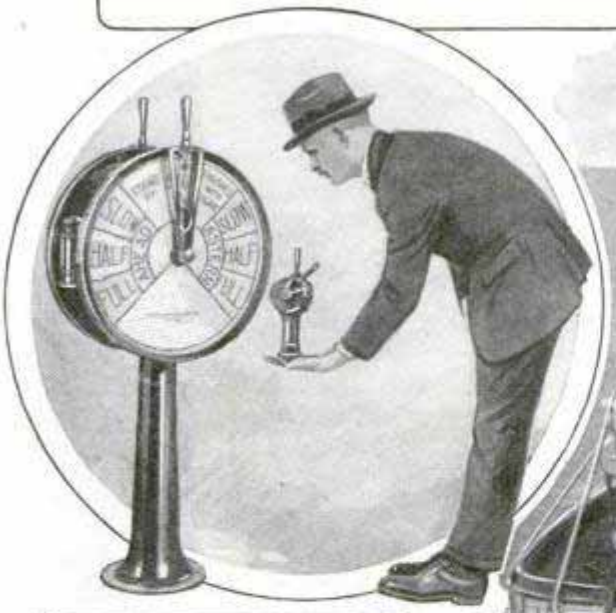
Metal Mike, because he replaced human hands and does the job better than any man could possibly do it, is the most interesting of the three. In the old days, two, three or four men struggled with a huge wheel, fighting the kicking rudder, to hold a plunging ship on her course. Then came steam, and later electric steering engines, which reduced the labor, but, if anything, made good steering harder, for the helmsman no longer had the "feel"

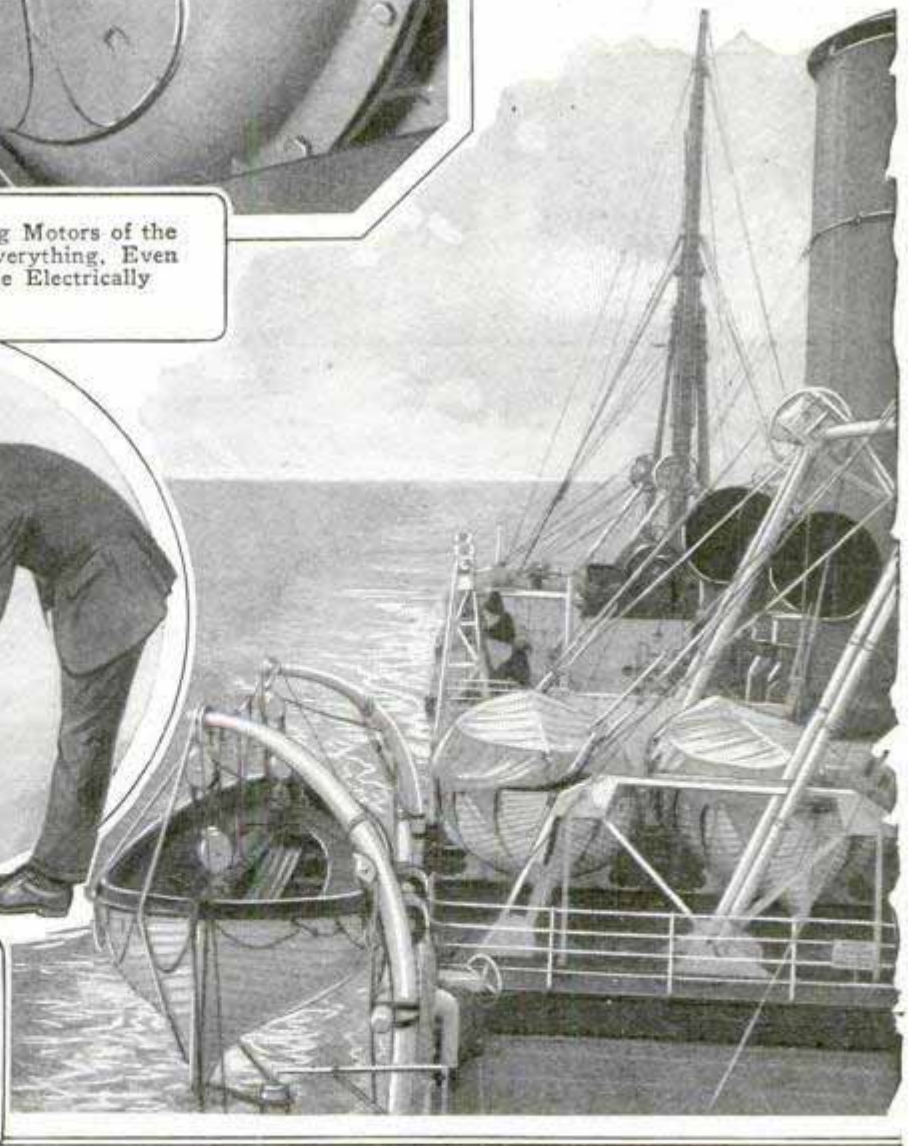


One of the Two Driving Motors of the Liner "California"; Everything, Even the Cooking, Is Done Electrically



Fire-Alarm Signals on a Private Yacht; the Presence of Smoke in Any Section of the Model Indicates the Location, While an Electric Bell Rings to Sound the Warning to the Officers





Ship's Engine-Room Control Signal, beside One Built for a Small Motorboat, and, Right, the Apparatus for Launching a Liner's Lifeboats

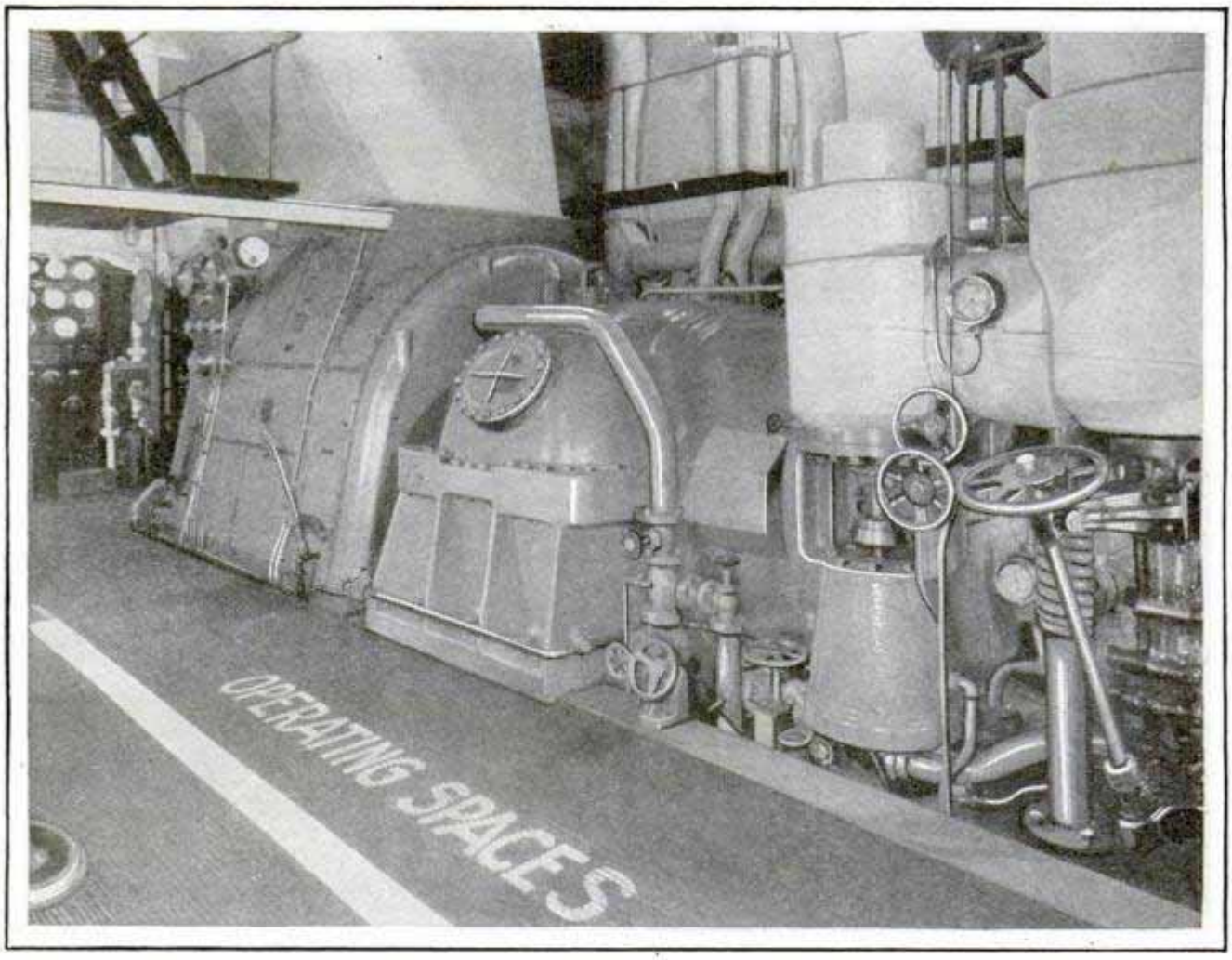
of the rudder to guide him. In fact, the only guide he had was the normal tendency of the rudder to return to an amidships position.

Steering a speeding liner, with the bow continually trying to fall off the course every time a wave slapped it, was no easy job. Good quartermasters became famous, and men like Herbert Hartley, late commodore of the "Leviathan," and other famous captains, rose through their ability to hold the old "St. Paul," "St. Louis," "Paris" and other American liners to their proper course.

But with the introduction of Metal Mike, everything was changed. The ship's bow need only be laid on her course, the gyroscope helmsman started by closing a switch, and the machine, with more than human intelligence, will hold the vessel to that course far better than the best steersman could do, and without regard to storms, cross-seas or other circumstances.

Metal Mike and the gyroscopic compass both utilize the same principle: the fact that a gyroscope revolving at high speed always maintains its axis in a fixed position with relation to the earth. The gyroscopic compass always points to the true north, and not to the magnetic pole, because the earth's rotation, not magnetism, is the controlling force.

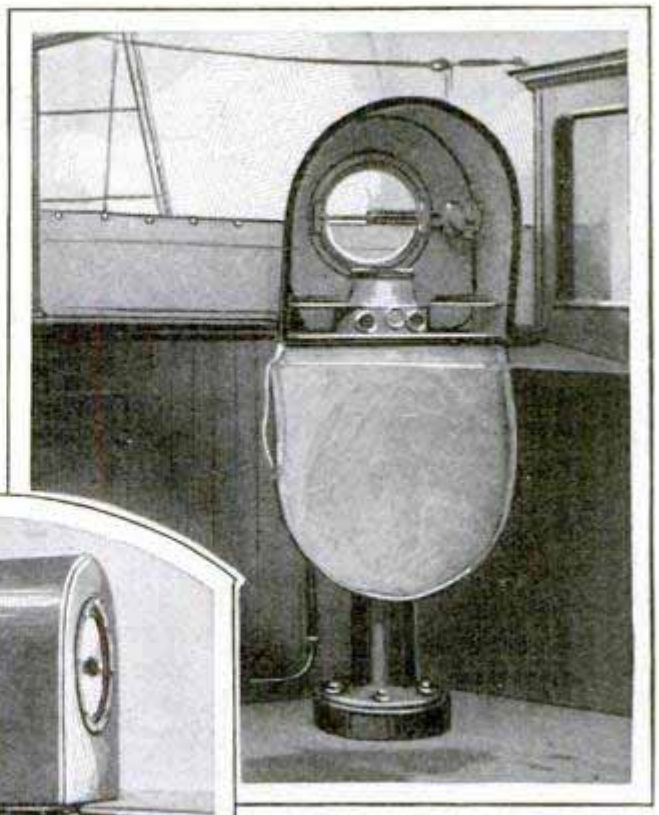
With the magnetic compass every course taken from the chart must be translated into a magnetic bearing before it can be transmitted to the helmsman, and every bearing taken from the magnetic-compass card must be translated into a true compass bearing before it is applied to the chart. That would not be difficult, if the magnetic-compass error was always the same, but it not only differs for every point on the globe, but is constantly changing from year to year, so sums must either be added or subtracted from every magnetic bearing, to correspond to a carefully prepared table covering the number of years since the chart plate was engraved.

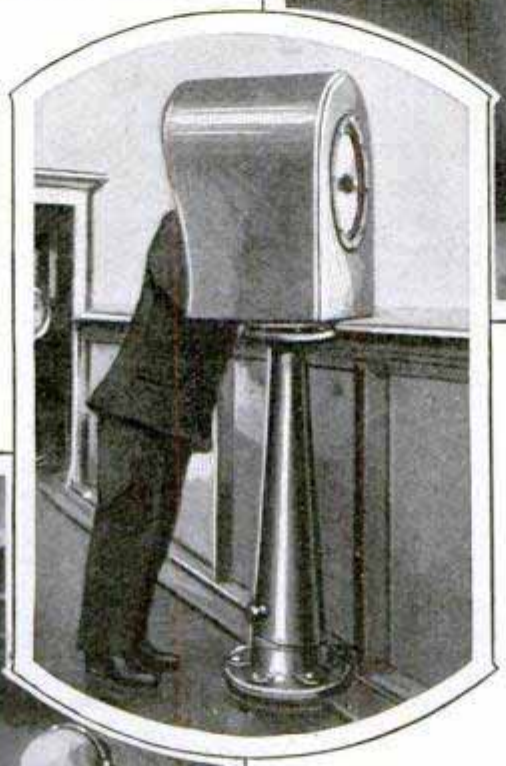


One of the Two Turbine Generators, Which Furnish the Electric Current to Run the "California," and Operate All of the Electrical Conveniences Which Make Traveling Safe and Pleasant

Metal Mike's compass brother eliminates all that. He points constantly to the north pole, instead of the magnetic pole, no matter where on the earth's surface he may be. Because he works on a mechanical and electrical principle, he doesn't need to be mounted on the bridge. In fact, the master compass is usually placed below deck in some distant compartment, with a series of repeater compasses hooked up to give identical readings in the chart house, on the bridge, in the captain's cabin, or any other place.

It is not difficult to see how such an uncanny instrument can be adapted to the steering itself. In its simplest form, a set of electrical contact points are mounted in the gyro compass, and, as soon as it begins to move to resist the turning of the ship, the circuit is closed, a small motor operating the steering wheel started, and the ship brought back to position, often before the eye could have detected it was beginning to yaw. An automatic course recorder, showing the steering of Metal Mike in competition with human control, illustrates the superiority of the machine over the quartermaster.





Officer of an Atlantic Liner Listening In As He Turns the Loop of the Radio Direction Finder; Above, the Revolving Sleet-Proof Vision Screen as Used on an Open Bridge

The automatic course recorder is another of the gyro-compass developments. A simple clockwork mechanism to turn a paper-covered drum, and a pair of recording pens operated by every movement of the gyro's axis do the trick.

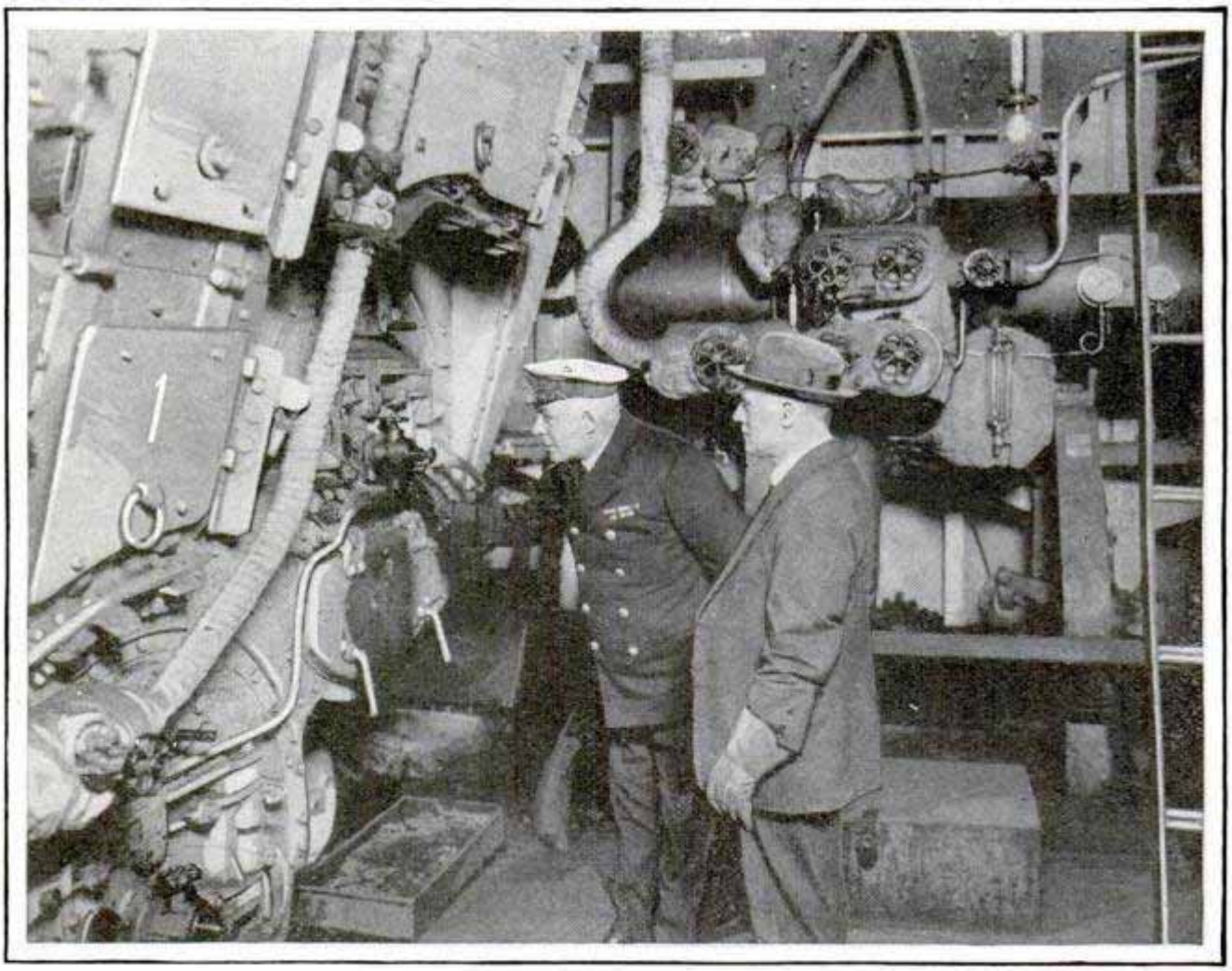
Electricity is doing so many things aboard ship these days that it has even supplanted the bull-like bellow of the old-time first officer and the megaphone which sometimes aided him in transmitting orders from poop to forecastle. Nowadays a complete telephone system connects the acres and acres of space within a big ship, while engine room, chart room, bridge, and other control positions are interconnected with loud-speaking phones. There is even a specially designed telephone instrument which can be used in the noisiest engine room to transmit the

voice only and eliminate all other sounds. Small ships, tramp steamers and others that cannot afford all the latest refinements of navigation as practiced on the north Atlantic, have not been neglected in provision for safety. Automatic wireless sets are available which send out an appeal for help without the aid of an experienced operator. With their direction-finding radio, larger ships in the vicinity can take the bearing of the signal, and by its intensity and the known range of the automatic sender, compute the distance, or if two liners equipped with direction finders get the signal, they can, through an exchange of messages, compute the exact location of the vessel in distress.

And to make sure that no wireless operator, working his set on some other wavelength, misses an appeal for aid, the bigger ships are being fitted with automatic alarms which respond only to the SOS call, when they ring a bell to attract the operator's attention.

Even the lifeboat has been taken care of with a wireless set of its own. Most of the larger liners now carry several power boats to tow the other life craft in event of shipwreck at sea. The power boats, with engines and battery power available, are equipped with regular radio sets. But the smaller boats have radio, too, a small set with collapsible mast and getting its power from a generator turned by a crank, like the old-fashioned magneto telephone. And, as there aren't enough radio operators on a ship to furnish one for every lifeboat, the little sets are entirely automatic. As long as you turn the crank the machine sends out the distress call.

The same efficiency is being applied in other directions, perhaps at the expense of some of the romance of the seas, but the increased safety makes the sacrifice worth while. In the old days of oil lanterns, when the lookout on the forecastle struck the bells at night and called back, on every half hour, that the lights were



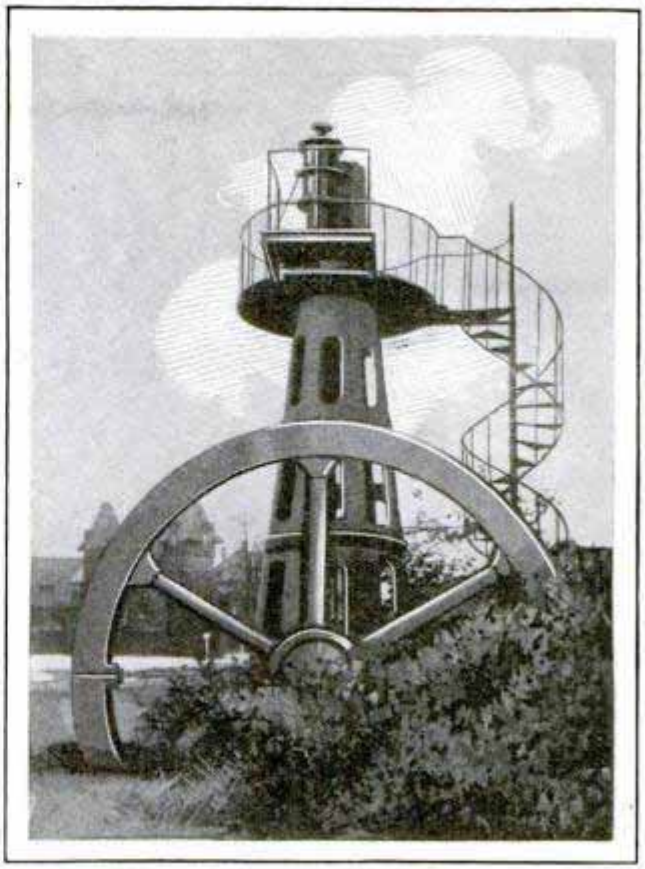
Courtesy Canadian Pacific Lines

Oil-Fired Boilers of the "Montroyal," Where Grimy Stokers Have Been Replaced by Pipes That Feed the Liquid Fuel to Jets in the Fire Box

burning bright, it was romantic. But nowadays there is an indicator in the wheelhouse carrying a number of pilot lights, and one lights up automatically to warn the officer of the watch if any one of the running lights goes out. And if one does, he only has to turn a rotary switch to bring another light into operation in place of the one that has failed.

Below deck the modern ship is progressing just as fast as it has on the bridge. Oil burners have displaced coal in all the better ships, and now powdered coal, fed through pipes like oil, is threatening to supersede the black liquid. Oil, in a dozen years or so, became almost universal on the bigger ships, as well as many of the smaller ones, because it saved time, money and labor. It displaced the sweating, laboring "black gang" of stokers; it reduced the time wasted in port because it could be pumped aboard faster than coal could be loaded; it eliminated the drudgery of cleaning ship after coaling and saved much repainting, while furnishings in the passenger cabins lasted longer with less frequent cleaning, and, finally, it made better and more economical operation of the engine room possible.

The new powdered-coal system, successfully tried last year by the U. S. shipping board on the freighter "Mercer," promises to introduce to the sea the same economy which has proved a money saver in plants ashore, including the great Ford power plant at River Rouge. The pulverized coal, mixed with air, is blown through pipes, just like oil, and fed into the furnace burners in the same way. The "Mercer" installation carried a small crushing plant aboard, so that ordinary fuel was loaded in the bunkers, and powdered as needed. This system eliminated the possible danger of increased fire risk in the fine coal dust. The coal may some day be crushed ashore and piped aboard into the fuel tanks.



Its Period of Duty Done, This Old Steam Engine Serves as an Observatory in Ironworks Grounds

OLD STEAM-ENGINE MONUMENT SERVES AS OBSERVATORY

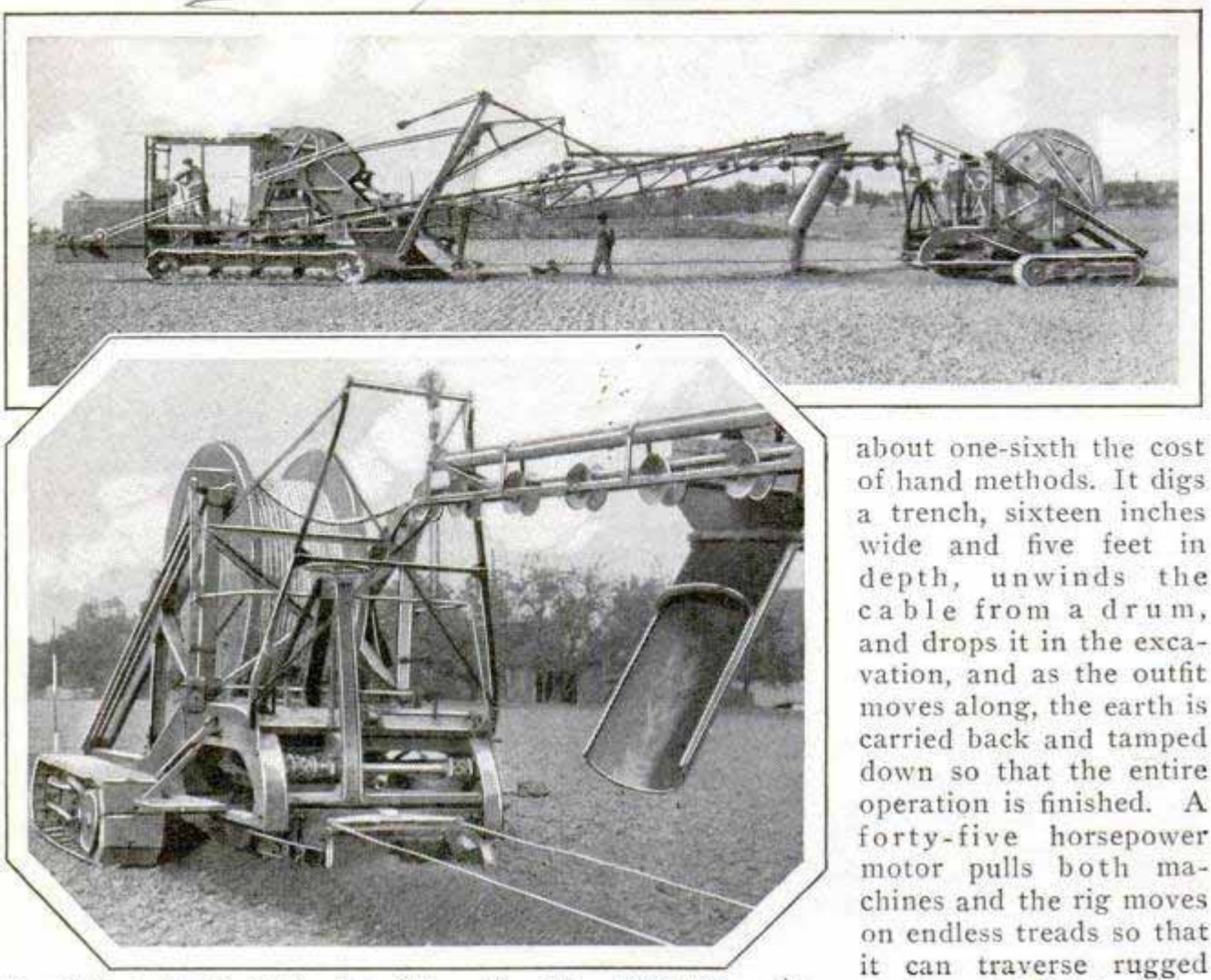
After nearly fifty years of service, a steam engine of the heavy-duty type has been converted into a monument on the grounds of an ironworks in Germany. A circular stairway leads to the top, from which the whole plant can be seen.

ARMLESS FLYER PLANS TRIP FROM NEW YORK TO PARIS

Loxla Thornton, Armless Aviator, Who Hopes to Make a Transatlantic Flight

Loxla Thornton, an armless aviator, is making plans for a transatlantic flight this year. He has been flying for nine years and can operate any standard make of craft without extra attachments, it is said. He controls the stick by means of an iron hook and it is reported that he has had no accidents in his flying.

GIANT TRENCH DIGGER DOES WORK OF MANY MEN

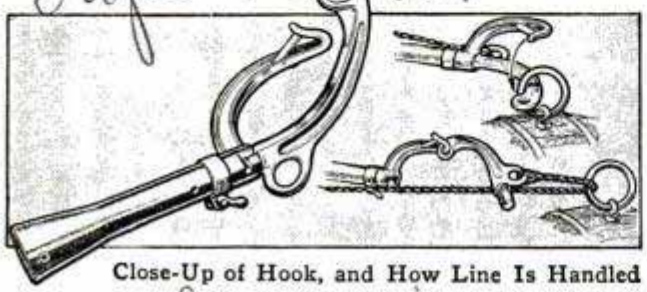


Top, Cable-Laying Outfit Complete; Below, Close View of Cable-Drum Carrier and Back-Filler Spout

For laying telephone and other cables, a combination unit devised by German engineers, does the work of many men at about one-sixth the cost of hand methods. It digs a trench, sixteen inches wide and five feet in depth, unwinds the cable from a drum, and drops it in the excavation, and as the outfit moves along, the earth is carried back and tamped down so that the entire operation is finished. A forty-five horsepower motor pulls both machines and the rig moves on endless treads so that it can traverse rugged territory. It will lay from 200 to 300 feet of cable per hour, depending upon the character of the soil, and only five men are required to manage the entire outfit.

BOATHOOK PUTS LINE IN RING AND HOLDS MOPS

With an improved boathook now on the market, the mooring line is automatically passed through the ring, saving work and time. This is accomplished by a spring which ejects the hook from its socket after the ring has been engaged. Line and hook are then picked up by a grapple at the side and drawn in. The shaft and holder of the boathook may also be used for scrubs and mops.



Close-Up of Hook, and How Line Is Handled

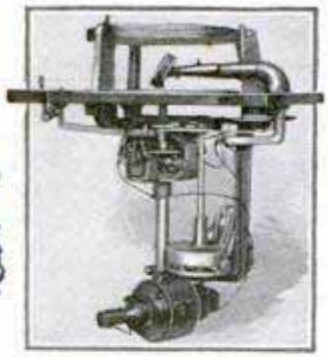
CATCH CROOKS BY TELEPHONE TO HELP REDUCE CRIME

Broadcasting news of a crime, with description of the criminals, to a score of towns and officers at one and the same time, has been made possible in a California county by co-operation between the telephone company and the sheriff's office. Immediately the latter receives notice of a murder, robbery or other crime, the sheriff's telephone operator calls the long-distance operator at telephone head-

quarters. All the deputy sheriffs, chiefs of police and constables, in twenty-two outlying towns and all the suburbs, are notified at once by plugging in connections to all of them. The sheriff's operator, in one message, gives all the available details of the crime with a description of the criminals and the probable direction of their flight. Tests have shown that not more than three minutes are required to inform all officers in the county to be on the lookout. Bridge tenders, ferry watchmen and others are included in the same telephone broadcast, being sworn in as special deputy sheriffs for such emergencies.

PHONOGRAPH UNIT CHANGES ITS OWN RECORDS

An automatic phonograph unit, built to fit into standard talking-machine cabinets and designed to play any number of records up to ten, changing its own records and playing the program over and over until stopped, is now on the market. It can be used, in connection with a radio set or a radio amplifier, to convert old-style talking machines into the latest thing in electrical and automatic phonographs.



Up to ten or twelve-inch records are carried above the reproducer on three supports and lowered onto the turntable, one at a time, until all have been played. A selector switch is provided so that any predetermined number of records can be played and the machine will then stop itself.

NATURAL GAS RUNS ENGINES IN AUSTRALIAN TOWN

Natural gas, discovered in Roma, Australia, during a search for oil, is used to operate engines as well as for lighting. There is an apparently inexhaustible supply of the fuel, which is delivered at pressures varying from 320 to 480 pounds to the square inch. Valuable products are obtained by filtering the gas and the exhaust as it comes from the engines.

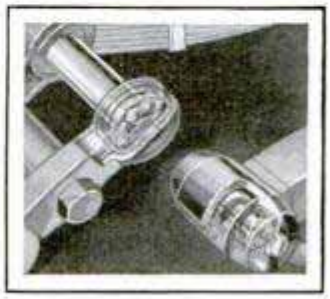
Miniature Lantern-Slide Projector Used by Schools in Nature-Study Classes

MAGIC LANTERNS ON DESKS HELP TEACHERS

Lantern slides in small boxes, containing an electric-light bulb, are employed in a New York schoolroom, to help teach the pupils about nature. Each box is like a little picture theater, the slides can easily be taken out and new ones inserted, and the children have a better opportunity to study the subject than they would, were it shown on an ordinary screen. After examining the slide, the pupil is required to write an essay about the picture it reveals.

BALL-BEARING AUTO SHACKLES ELIMINATE SQUEAKS

To eliminate squeaks and rattles, and to make the car ride more easily, ball-bearing auto spring shackles have been introduced. No adjustments are required, and a special advantage claimed for them is that no greasing is necessary, as permanent lubrication is provided, good for the life of the car and eliminating grease cups and fittings.



Visors on These Spectacles Relieve the Wearer of Unpleasant Strain as They Shade the Eyes

VISOR GLASSES FOR AUTOISTS RELIEVE EYE STRAIN

Sun visor, glare shield and driving glasses are combined in one pair of spectacles devised for the safety and comfort of automobile drivers and others who have to face bright lights. The upper part of the lenses is of a restful, transparent green shade and the lower part, a semi-smoked glass, practically clear. This portion is employed while driving. When the glare of headlights strikes the eyes, the wearer simply lowers his head and looks through the upper half of the lenses. The protectors can be worn in front of regular glasses if necessary.

EARTH'S ROTATION CHANGES

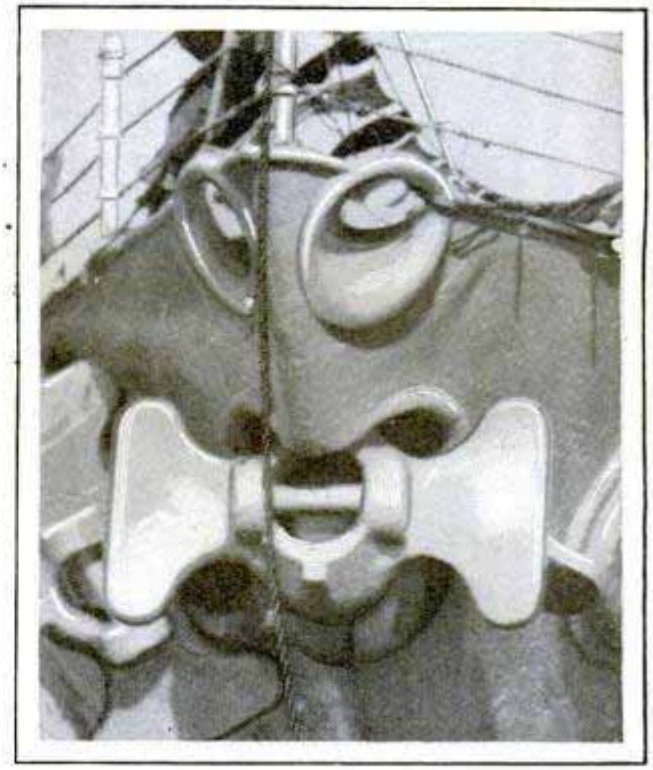
That the rate of the earth's rotation changes from time to time and that this fluctuation may be due in part to the effect of earthquakes, are possibilities advanced by Dr. Benjamin Boss, of the Carnegie Institution. He has found evidence for the apparent variation in a long study of star positions, and the change appears to be related to the frequency of earthquakes. Further indication of the fluctuation is suggested by the fact that, when checking clock time with the stars, there is a daily variation in the clock rate, showing that the earth may change its daily rate of rotation.

TELEPHONES FOR PLANES

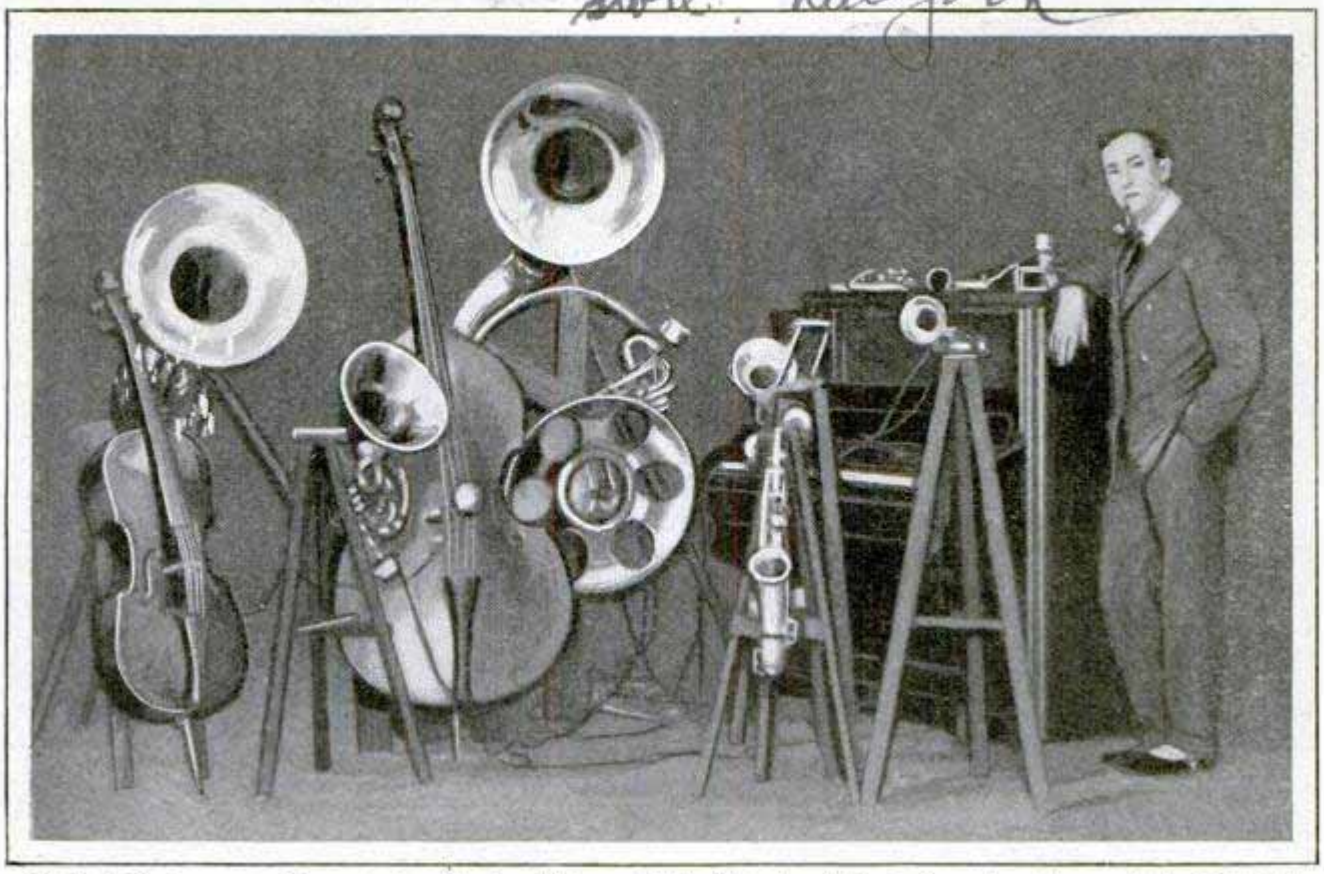
Passengers in cabin planes of a western air-transport company, may talk with the pilots through a special telephone system recently installed. Except while landing and taking off, occupants of the cabin are permitted to ask the pilot questions concerning the route and the position of the ship. It is expected that the phone will meet with the favor of the pilots, as many of them find long air journeys monotonous and welcome a call from the passengers.

BATTLESHIP HAS FIGHTING FACE CAMERA REVEALS

That there is a sound basis for the expression, "in the face of the enemy," when speaking of war vessels, is seen by the accompanying illustration of the bow of the U. S. S. "California." The hawser holes have the appearance of eyes and the anchor resembles the teeth of some large animal. The effect is not so pronounced at all times, but is frequently noticeable from certain angles.



Warship's Stern "Face" to Challenge the Enemy; Bow of the U. S. S. "California"



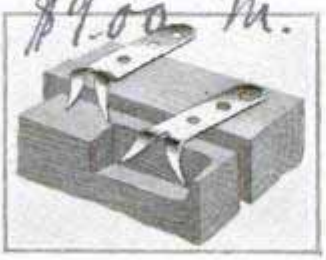
Musical Instruments, Connected to the Amplifier on Radio Set, Are Said to Reproduce Tones of the Original Pieces More Faithfully, for Better Reception of Orchestra and Solo Numbers

MUSIC BY PHANTOM ORCHESTRA LATEST RADIO NOVELTY

Improved reproduction of radio and phonograph music is claimed for the "phantom orchestra" an eastern inventor has devised. It is an assembly of twelve musical instruments, each one serving as a loud speaker to reproduce the tones played by a unit of the same kind in the original orchestra. The important theory of operation is that each instrument will respond to the vibrations of tones it is made to produce, that is, the violin as a loud speaker will reconstruct the resonant tones of a violin, and the cello, piano or other pieces will function in the same way. To operate the wind instruments, a vibrating diaphragm is placed across the mouthpiece. Music from the radio set or phonograph is amplified by vacuum tubes and then transmitted to the manless orchestra. In a recent test of the plan, listeners said that the timbre and individual tone characteristics of the various pieces were rendered with remarkable fidelity.

PRONGED BAND TO HOLD JAMBS ELIMINATES NAIL HOLES

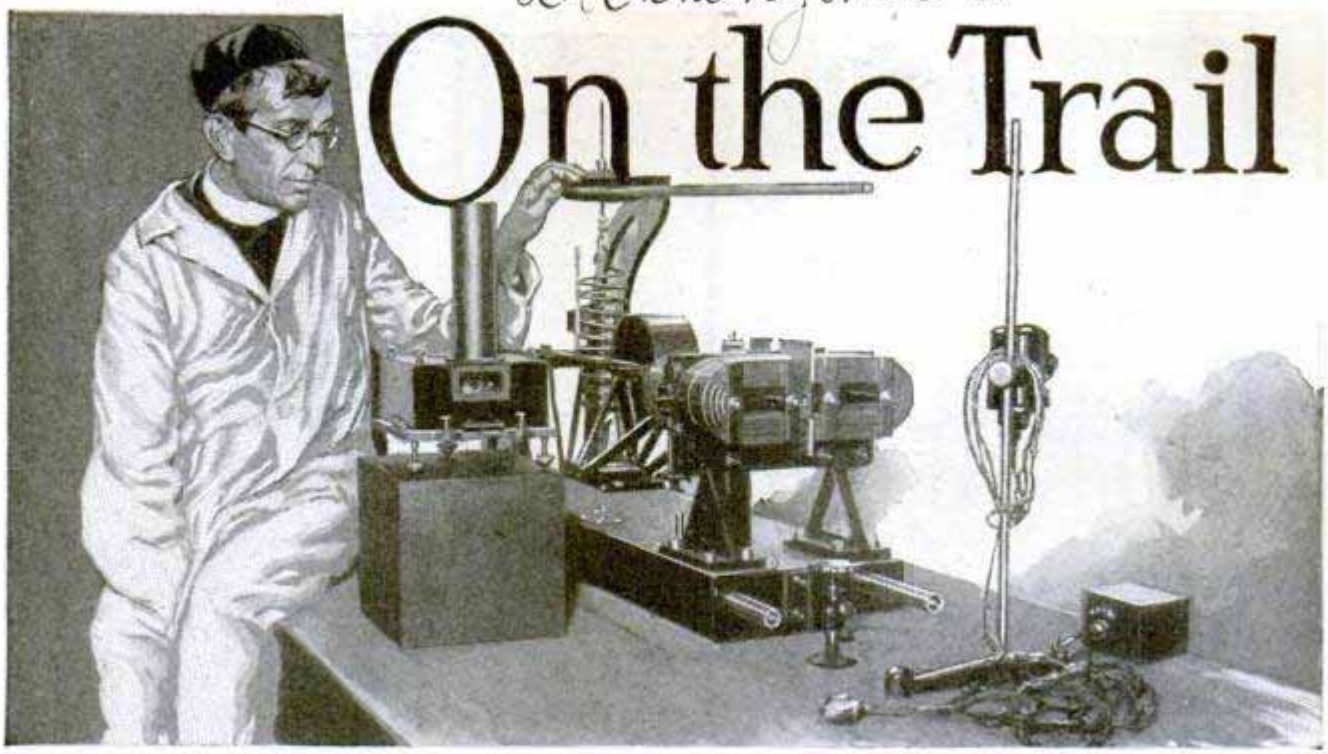
For fastening the jambs of doors or windows, shelving and other installations, a band with spreading prongs at one end has been introduced. It eliminates hammer marks, saves puttying up nail holes and can be driven in without splitting the wood. The prongs spread as they are forced in, insuring a firm hold. The bands can be more quickly applied than nails and consequently save both time and work for painters and carpenters, as well as for home mechanics.



NEW USE FOR RICE HULLS

To facilitate the dumping of wet, sticky soils from automobile trucks, engineers, working on a grading contract in California, scattered rice hulls, a waste product, in the trucks. Being slippery, the hulls proved entirely satisfactory and a light covering of them was found sufficient to cause the soil to start slipping out when the truck bottom was raised.

On the Trail



Father Francis H. Tondorf, of Georgetown University, America's Most Famous Earthquake Observer, with His Exceptionally Sensitive Galitzin Vertical Seismograph

WHERE will America's next great earthquake hit, and what will the damage be?

In seismological laboratories scattered from coast to coast, patient observers are recording on smoked paper the earth temblors of all the world in an effort to find an answer to those two problems.

The answer to the first is being slowly pieced together from the study of each year's quakes, their probable causes, and other data which may eventually solve the riddle of why and when an earthquake is to occur.

The answer to the second will depend largely on the use to which the country puts the solution of the first, for damage will be lessened in direct proportion to the precautions taken in earthquake zones to build shake-proof houses and offices.

One of the dozen greatest earthquakes of all times occurred little more than 100 years ago in the heart of the Mississippi valley, yet damage was very slight, simply because the country affected was sparsely settled. That was the New Madrid, Mo., quake of 1812, which was responsible for the formation of Reelfoot lake, in northwestern Tennessee, and for the sinking of all northeast Arkansas and southeast Missouri, a region still known, therefore, as the Sunken Country.

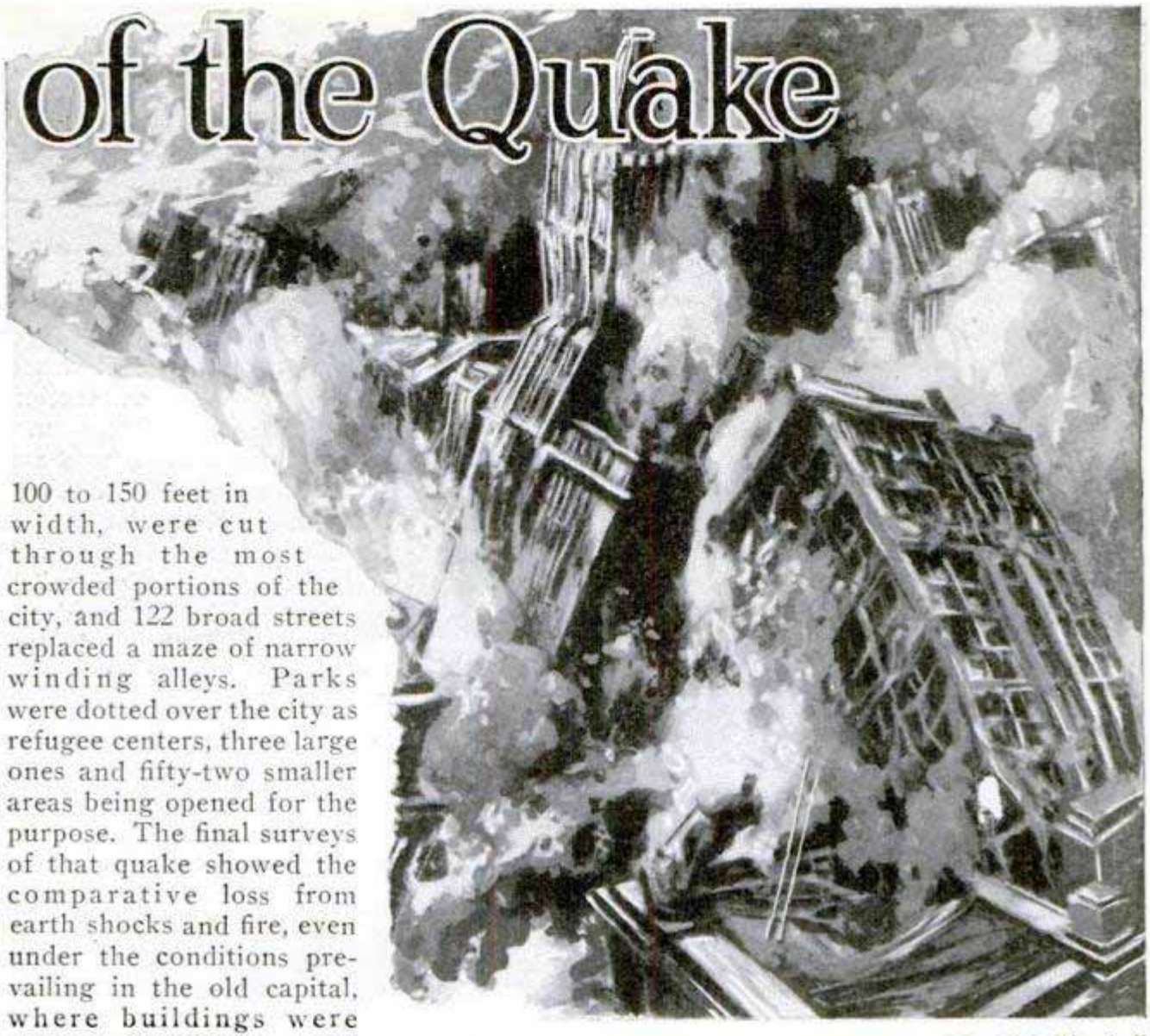
Last year, at the height of the Mississippi floods, the same region suffered another quake, this time a slight one, which did no particular damage. A heavy temblor in the same zone, according to E. Lester Jones, director of the United States coast and geodetic survey, might shake down old and poorly constructed buildings within that area.

That practically quake-proof building is possible was demonstrated during the great Japanese earthquake of 1923, which did such enormous damage to Tokyo and Yokohama. Steel and concrete buildings came through the disturbance with slight damage, while more flimsy structures fell in ruins and then burst into flames which spread into a new trail of destruction.

Fire, and not the shaking, is responsible for a great part of the loss of life and property when a quake rocks a densely populated modern city. Stoves and open fires spill live coals into the ruins, broken gas mains are touched off by chance sparks, and, at the same time, the water mains are broken and rendered useless. As San Francisco found in 1906, only dynamite and back-firing can stop a conflagration under such circumstances.

The Japanese government took the lessons of that quake to heart, and rebuilt the destroyed capital along modern lines. Residential, commercial and industrial districts were segregated, six great avenues,

of the Quake

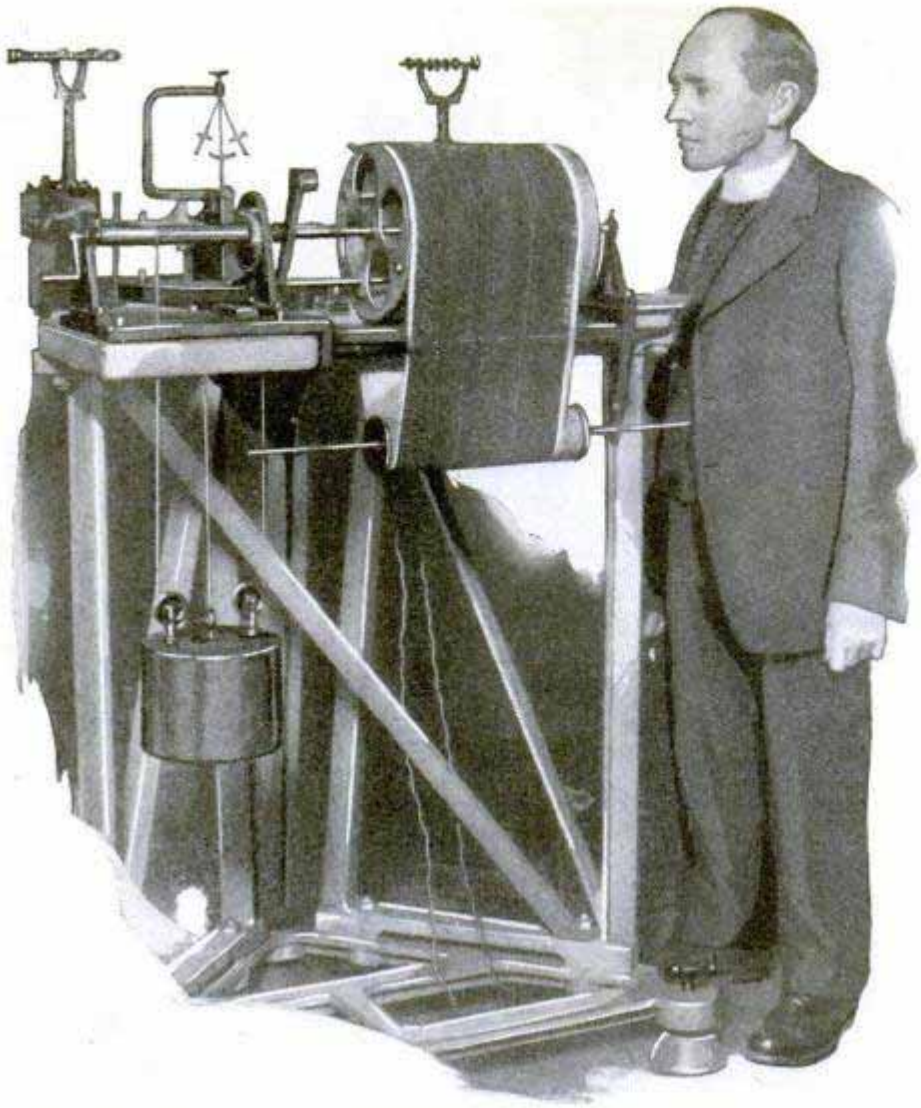


100 to 150 feet in width, were cut through the most crowded portions of the city, and 122 broad streets replaced a maze of narrow winding alleys. Parks were dotted over the city as refugee centers, three large ones and fifty-two smaller areas being opened for the purpose. The final surveys of that quake showed the comparative loss from earth shocks and fire, even under the conditions prevailing in the old capital, where buildings were shaken down with ease. The number of houses totally destroyed by the quake was 128,266, while 447,128 structures were claimed by fire.

The year 1925 was notable for a number of fairly strong shocks in the United States and Canada, as well as another destructive quake in Japan, and out of that year's activities grew the present earthquake survey being made by the Carnegie Institution, the coast and geodetic survey and the Engineering-Economic Foundation. The same year saw earthquake insurance established in the United States, with the Woolworth building insured for $5,000,000. The survey so far has been carried out mainly in California, with both state and federal governments co-operating. Another survey has been started in the Mississippi valley, where Dr. James B. McElwane, S. J., president of the Seismological Association of America, has opened a new recording station at Florissant, Mo., near the New Madrid "fault." The Jesuit fathers are the most numerous earthquake observers in the United States, and probably in the world. Their universities have seismographs scattered all over the country, with the center of activity at Washington, where Father Tondorf, of Georgetown University, is usually the first to announce each successive quake.

That there is a relation between widely scattered disturbances seems certain. The best explanation of their cause is readjustment of the earth to relieve the strains and stresses of internal pressure. The crust slips and slides, sometimes in a limited locality, and again over a wide area. The Montana quake of June 27, 1925, while severe, did not cause any vast damage, aside from loss to the railroads whose canyon tracks and tunnels were damaged to a serious extent.

Two days later, and hundreds of miles

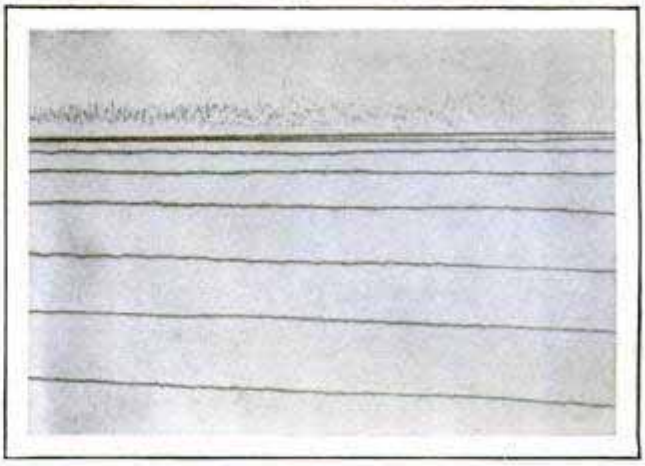


Watching Quakes on the Pacific Coast; Prof. J. M. Jung, S. J., at Gonzaga University, Spokane, Wash.

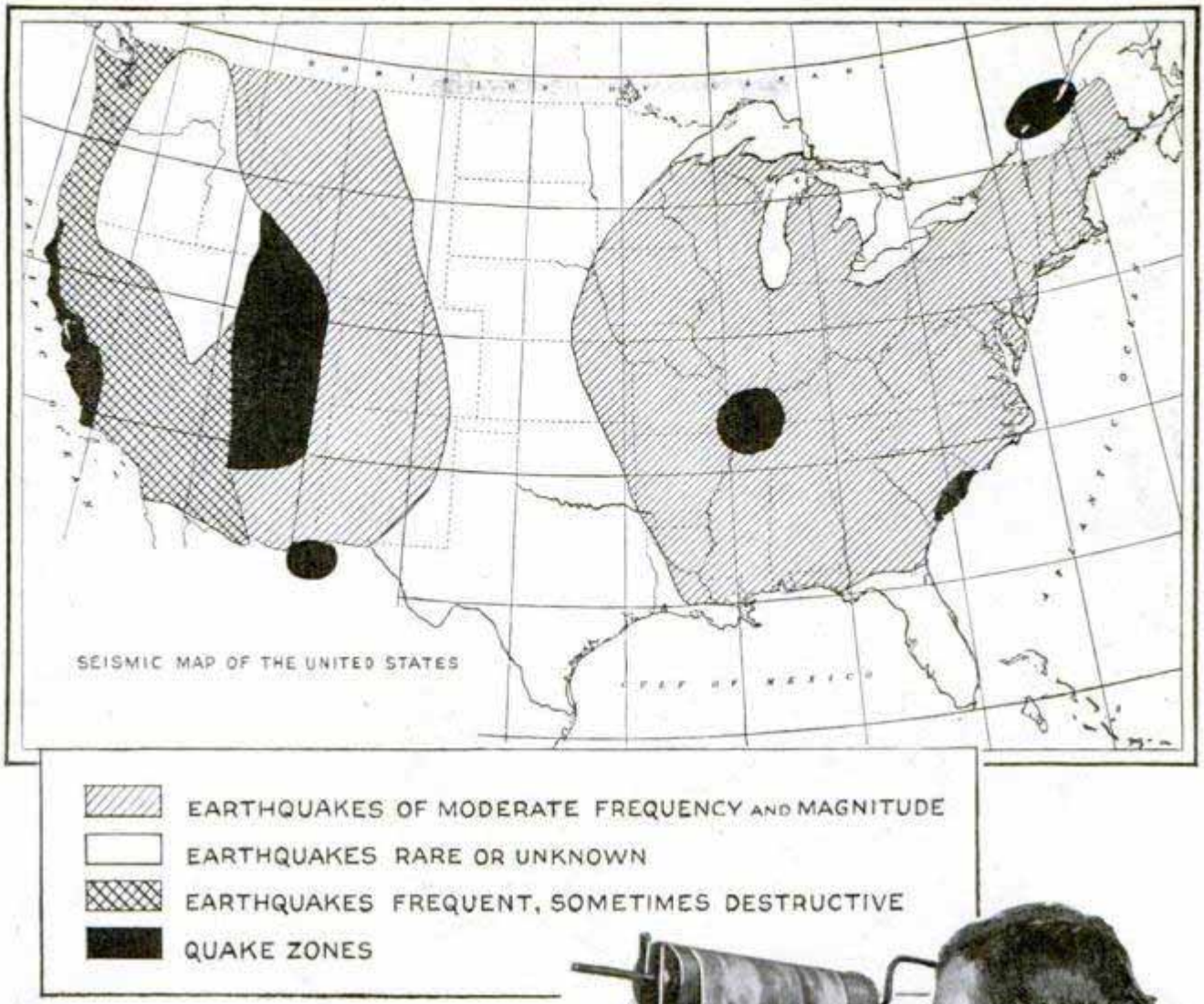
away to the southwest, Santa Barbara, Calif., was visited by a destructive temblor, with further shocks the following day. Santa Barbara is located on the great San Andreas fault, stretching for 600 miles through the Coastal range, passing just west of San Francisco, east of Los Angeles, and, finally, an indeterminate distance into the Gulf of Mexico. The great quake of 1906 occurred along the San Andreas rift, taking in a stretch of some 150 miles with San Francisco near the center. One side of another well-known geological fault extends approximately along the line of the Hudson river. There is the possibility that some time during the Ice Age the New York side slipped under the strain of a terrific tremor. However, today the geological position of Manhattan island and the surrounding territory is such that about the only danger of even a slight quake comes from the fact that Mother Earth may decide to do a mild "black bottom" in the vicinity of northern New England, just as she did in February, 1925.

Late last fall, representatives of twenty-nine nations, meeting at Praha, Czechoslovakia, proposed a plan whereby the mysterious ocean canyons, or "deeps," are to be probed soon in order to trace their possible connection with earthquakes. Far-reaching and deep-set are the canyons. The Aleutian deep, largest in the Pacific, extends for 1,500 miles and is five miles deep. The Nares deep, largest in the Atlantic, falls more than five miles. Other great depths are off the coasts of Mexico, Java and Sumatra. Since three-fourths of the world's earthquakes have their cradle in the sea and particularly in the Pacific, the probe should be of great importance. New seismograph stations will be established and those on hand improved, so that, when a quake occurs, its location may be determined.

Also last fall, Prof. Akitune Imamura, of the Tokyo Imperial University, announced that Prof. Ishimito, one of his colleagues, had developed an instrument called the clinograph, which was capable of producing an earthquake warning prior



Series of Wavy Lines across the Seismograph Chart, Marking the Vibrations of a Distant Earthquake



to the shock itself. Prof. Imamura pointed out that a short time before an earth tremor occurs, a slight tilting of the earth's surface takes place. The clinograph's function is to detect this.

The movement in America in recent years urging the serious study of the art of earthquake-proof construction is, after all, an echo from the ancients. The earthquake menace has been present ever since the world began cooling off. Pharoah Cheops, who achieved the famous pyramid at Gizeh, without a doubt built it because he wanted a final resting place that would withstand the ravages of earth tremors. For a similar reason, the Mayas of Central America built pyramid-shaped temples of unusually thick walls.

While earthquakes are sure and inevitable as the daily rise of the sun, it is beginning to look as if man, with his ever-increasing knowledge about them, may one day win in his battle with the centuries-old menace.

Earthquake Map of the United States, and Father Tondorf Studying a Quake Record; the Black Spot at the Mississippi-Ohio River Junction Marks the Scene of the New Madrid Disturbances

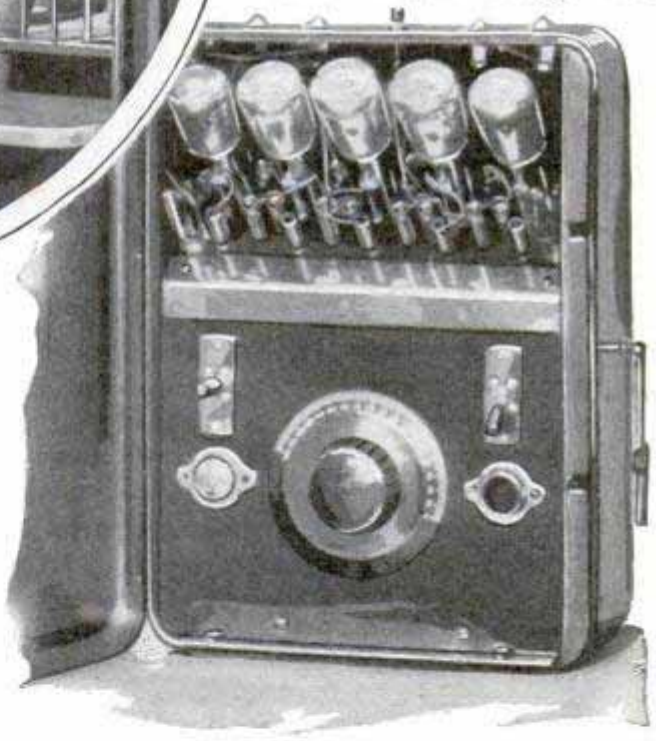
CASHIER TRAPS BANK BANDIT BY RAISING HANDS

Raising the hands at the command of a bank bandit, proves costly for the gunman, with an alarm system an eastern inventor has introduced. As the cashier lifts his arms, his hands, coming close to a rod on the wall, create a magnetic disturbance which causes electrical relays to function and operate an alarm. The signal is also repeated at police quarters to summon aid. The apparatus is hidden from the bandit, and as he cannot hear the alarm, he is not likely to molest his victim as long as his orders are obeyed.

Cashier Obeys Order of Bandit, and as He Raises His Hands, Alarm Is Sounded; Relay Unit at Right

TELEVISION LINKS SHIP TO LAND IN SUCCESSFUL TEST

How would you like to be halfway across the ocean, perhaps a bit out of sorts, and then suddenly see the face of your best friend smiling at you from a screen? Such thrills may be the common lot of ship passengers in the near future, for television already has linked the liner "Berengaria" with land in this way. Stanley Brown, chief radio operator of the ship, enjoyed the thrill of his life when he saw the face of his fiancee, Miss Dora Selvey, on the test screen with which television experiments were being conducted. She was in the broadcasting studio in London, many miles away, but he recognized her distinctly, even her special way of dressing her hair, and when she turned so that her profile came in view, others, too, identified her. According to John L. Baird, inventor of the apparatus used in the tests, it is now only a matter of time until one-half of the world will be able to see as well as hear what the other half is doing. He believes that the day is not far distant when persons crossing the Atlantic will be able to see, in colors, all sorts of performances, such as games, parades, meetings and other events worth recording, that may be happening on land thousands of miles away.



¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics.

COAL MINED WITH FROZEN GAS AS POWDER SUBSTITUTE

Marked reduction in coal mining hazards is seen in the development of a process for extracting the coal by means of frozen liquid carbonic gas instead of with dynamite. While the method is still in an experimental stage, engineers believe that it has great possibilities. The liquid gas, contained in a steel shell, is inserted in a four-inch hole, drilled in the coal. The vapor is far below the freezing point and has a pressure of 2,000 pounds to the square inch while in the shell. By means of an electric fuse, the temperature of the gas is raised to a point where the pressure is increased to 20,000 pounds to the square inch. A plug of softer metal in the shell gives way at this pressure, and the gas rushes out, breaking up the coal. Experts point out that, if this process proves successful, it will greatly simplify the actual work of getting the coal out.

GREENHOUSE RUNS ON WHEELS AND PROTECTS PLANTS

Patrons of a London florist are served by a traveling greenhouse which is driven to their doors and the order delivered directly from under the glass. The plan saves wrapping and handling the plants unnecessarily, keeps them fresh and protected from unfavorable weather, and the sight of the auto greenhouse attracts attention as it passes through the streets.

His Traveling Greenhouse Keeps Flowers Fresher and Is Attractive

Window in Umbrella to Make Walking Safer on Rainy Days; It Is of Unbreakable Transparent Substance

WINDOW PANES IN UMBRELLAS TO PREVENT ACCIDENTS

Persons carrying umbrellas are protected from collisions with other pedestrians and cars by a small window in the canopy. It affords a clear view when the umbrella is opened up, even if it is held down in front.

STUDY BOWLING BALL'S MOTION TO IMPROVE GAME

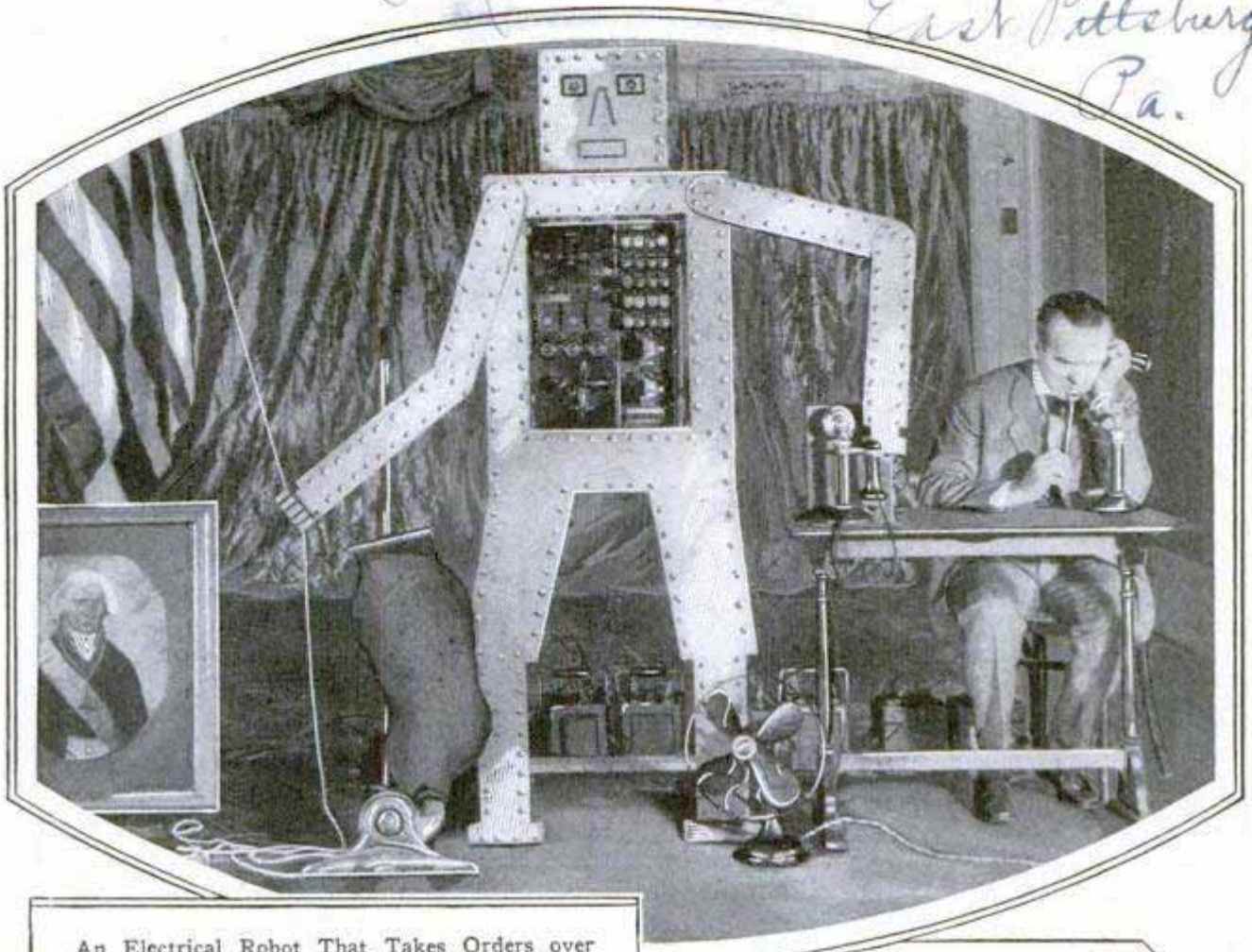
Science has been making an analysis of bowling to determine the rate of speed of the balls, how much they curve and other interesting factors about them. Dr. L. W. Taylor, of Oberlin College, has devised an apparatus whereby the passage of a ball is registered to the hundredth of a second at twenty-inch intervals down the alley. A catapult is used to propel the ball. From facts so far learned, some of the accepted theories with regard to a ball's motion have been found incorrect, but friction seems to vary with the speed.

THIS AUTOMATIC AGE AND MACHINES THAT

In This Automatic Age, Machinery Is Eliminating Personal Service; at the Left Is a Machine That Sells Handkerchiefs in London Subways, and Next, a New Device That Polishes the Fingernails, Two at a Time

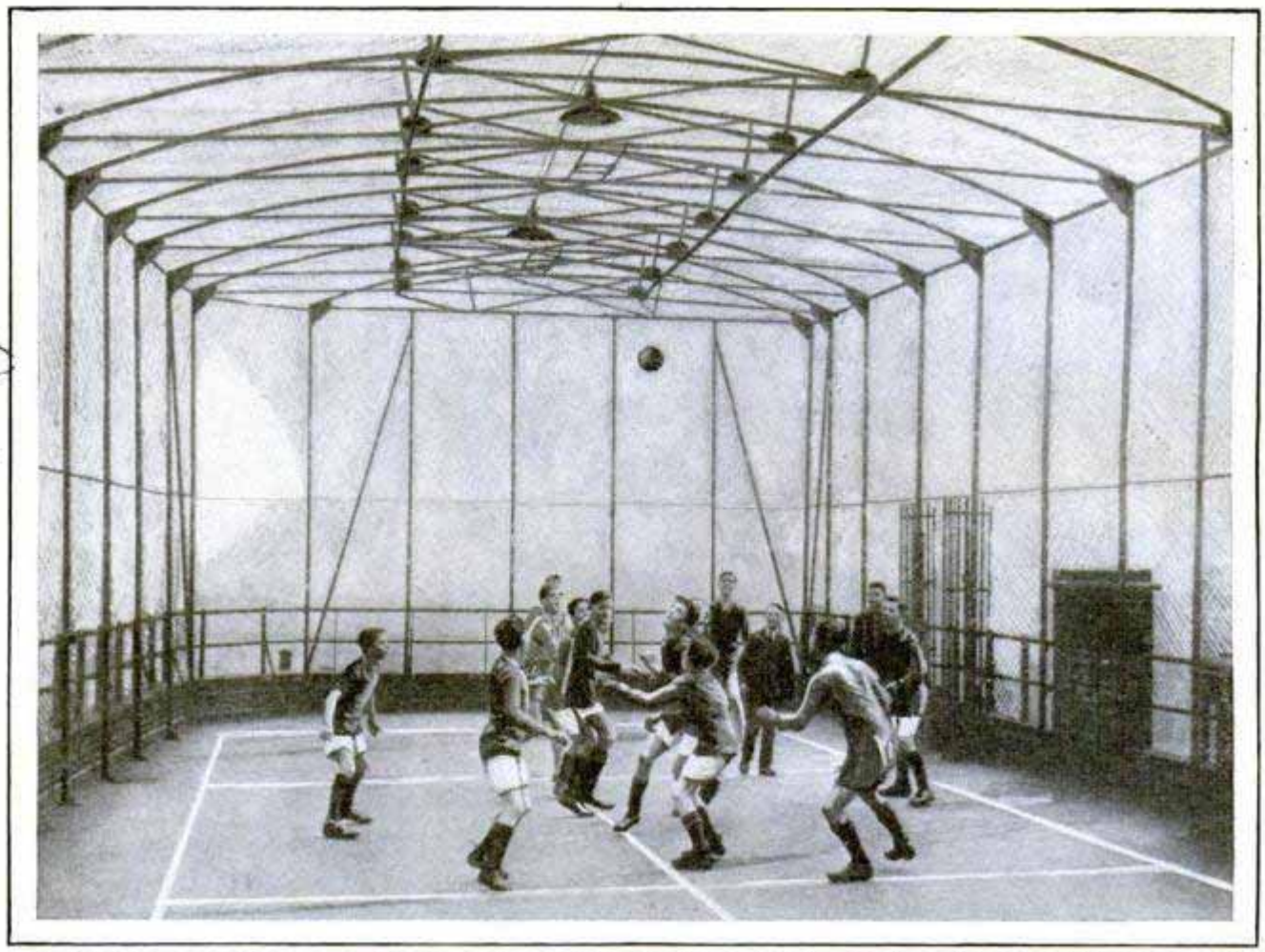
Everything, from Counting Election Votes to Selling Merchandise, Can Be Done Quicker and Better by Machinery, Releasing an Army of Workers for Other Occupations; at the Left Is a Voting Machine Used in New York; with Its More Than Human Intelligence It Receives the Votes of the Electors and Totals Them Up as It Goes Along, Eliminating the Long Nights of Costly Hand Labor Entailed by the Old Australian Ballot System; Above Is a Machine for Dispensing Several Different Brands of Cigarets; Anything Sold in Ready-Prepared Packages Is Easily Merchandised by Machinery; Many of the Automatic Vending Machines Are Triumphs of Ingenuity, So Perfectly Built They Will Reject a Slug and Even Return a Badly Worn Coin; Others Will Take Coins of Various Denominations, Deliver the Merchandise and Return the Correct Change, as Well and Quicker Than a Clerk

REPLACE HUMAN HANDS AND HUMAN BRAINS



An Electrical Robot That Takes Orders over the Telephone and Then Executes Them, Is Shown Unveiling a Statue of George Washington; It Also Started a Fan and Cleaned Floors

Even Change Can Be Made by Machinery as Well as by a Cashier; the Machine Above Takes Different-Size Coins and Returns Others of the Proper Size to Fit Vending Machines; at the Right, an Automatic Telephone-Call Recorder That Takes Messages While You Are Away



Football Game in Progress on the Roof Playground; the Space Is Also Used for Tennis and Cricket, and Proves a Valuable Feature of an English Settlement House

ROOF SERVES AS PLAYGROUND FOR FOOTBALL AND TENNIS

Tennis, cricket and Rugby football are played on the roof of an English settlement house. A screen over and about the area prevents the balls from falling to the street, and the space is large enough for a number of players at one time.

EXTENSION LIGHT CORD IS FLAT TO FIT UNDER RUGS

Longer wear for the cord, improved appearance and less wear on the rug or carpet are afforded in a rubber-insulated extension cord that is flat instead of round. There is less tendency for the wires to break and the material is suited for connection with electrical appliances of all kinds as well as for floor lamps.

Electric Cord in Form of Flat Tape Slips under Rugs with Little Trouble and Decreases Wear

FAULTY TESTING OF AIRPLANES ONE CAUSE OF CRASHES

Army test pilots deliberately try to wreck the planes while they are in the air, in order that the severest tests possible may be applied. By the time the trial flight is over, the tester knows practically every characteristic of the ship. England and Germany both have a special testing bureau for commercial planes as well as military ships, and the establishment of a similar institution here has been recommended. It is believed that failure to give the ship an adequate test is one explanation of some of the mysterious crashes that occur in planes thought to be entirely safe. Not long ago, a Mexican pilot, flying at high altitude, in an effort to penetrate fog and clouds, nearly fell to his death when the ship stalled and plunged into a tail spin. It fell 5,000 feet

in a few seconds, the descent being so rapid that the pilot was pinned against the side of the fuselage and almost unable to move. But at 3,000 feet, he managed to bring the plane out of the spin and continued his journey. The structural parts of the ship withstood the fall without damage, but its tendency to spin had not been discovered before the flight.

MOTOR SAWS THAT CUT STONE SPEED CATHEDRAL WORK

Motor-driven saws, drills and planes are used in cutting stone for the modern building. How they save time and expense is illustrated in the work now being done on the Washington cathedral. The builders' specifications call for more than 260,000 blocks, weighing from 300 to 500 pounds apiece. The plain ones cost approximately $10 each and the more elaborate $300, while many thousands of molded and carved stones, costing from $50 to $100 each, will be required. As each block is cut and shaped, it is given a number to correspond with that on the blueprints. Building the stonework on the cathedral is thus simplified, the task being somewhat like that which pleases the child—fitting blocks together.

ELECTRIC DRILL POLISHES AUTO WITH SHINING DISK

By the addition of a patented disk to the electric drill, an effective polishing unit for the automobile is quickly formed. The disk will fit any drill chuck up to one inch, and is used in connection with a rubbing compound and water, to loosen the grime and dirt. A lustrous surface is the result of the treatment, at a minimum of hand labor.

¶Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

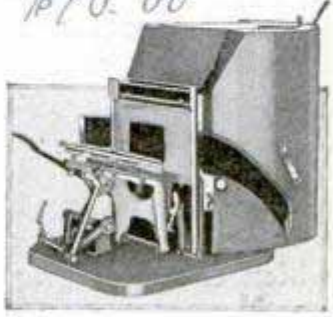
Indian Profile Formed of Cigar Bands; a London Woman Makes This Unusual Craft Her Hobby

PICTURES FROM CIGAR BANDS FORM UNIQUE GALLERY

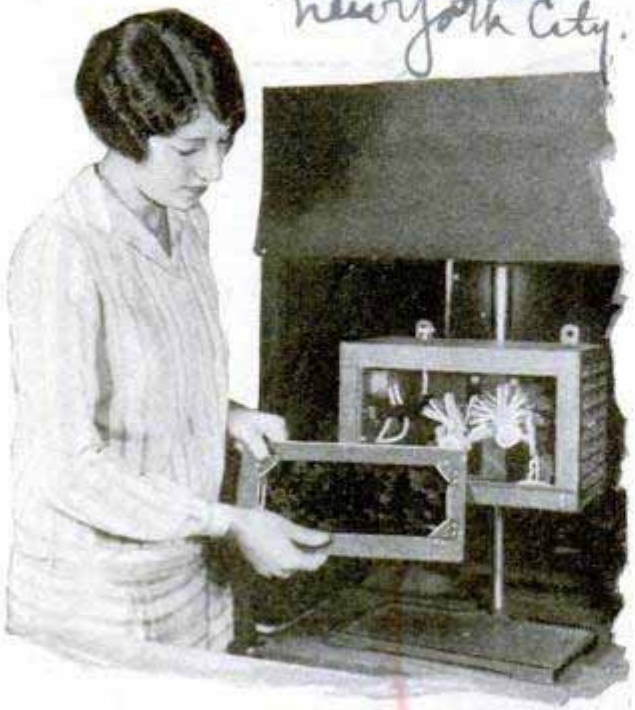
One of the oddest picture galleries in the world is to be found in the home of a London woman who has been collecting cigar bands for the last twenty-five years and making portraits and other designs from them. Her showing includes some 150 pictures, and the bands from which they are fashioned came from cigars smoked by famous Englishmen and others in all parts of the world.

RAPID PHOTO-PRINTING PRESS ELIMINATES TRIMMING

Operated on the same principle as a job-printing press, a rapid photograph-printing unit causes the negatives to register with a uniform margin on the paper so that trimming the prints is not necessary. Paper is fed on a platen and, with pressure of the left hand, is brought in contact with the mask and negative.



ULTRAVIOLET RAY "DETECTIVE" REVEALS FORGED CHECKS



Part of the Ultraviolet-Ray Apparatus in Which Fraudulent Checks and Other Articles Are Detected

Further practical use for the ultraviolet rays has been discovered in the field of criminal investigation. With a specially constructed instrument, the rays can be made to reveal forged checks, counterfeit money and other fraudulent articles, including adulterated liquors. This is accomplished by the peculiar reaction of the rays on foreign substances of various kinds as compared to their effect on genuine and ordinarily used materials.

MAGIC DRAFTSMAN TRACES MAP DIRECT FROM PHOTOGRAPHS

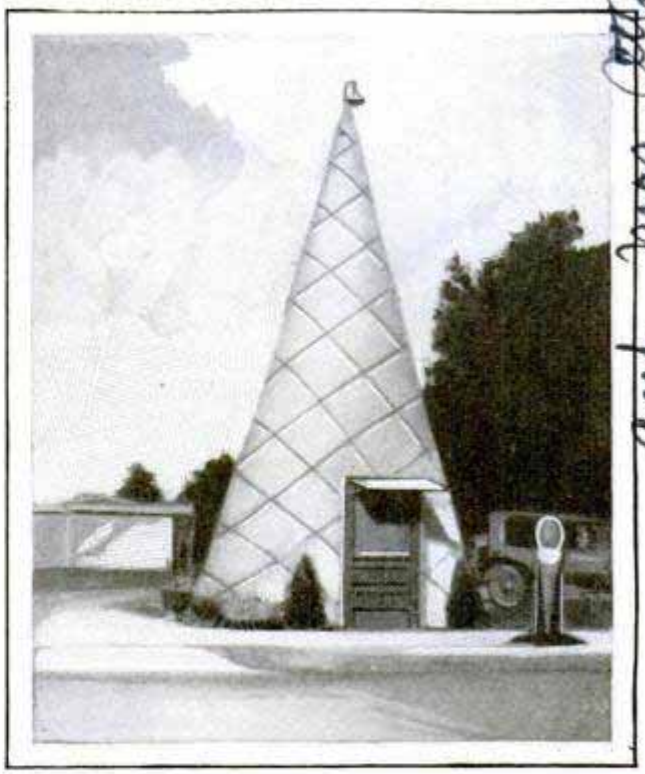
What experts declare will be a great aid to the aerial surveyor, and others, is a drawing instrument that reproduces an accurate contour map from stereoscopic photographs. The photos are observed through special eyepieces, with the result that an apparently solid model confronts the observer. A floating mark is then manipulated, seemingly in contact with any part of the scene, and its movements are automatically registered on a sheet of paper on the drawing board. The operator, using the elevation above sea level from which the photographs were taken, as a starting point, may then adjust the floating mark to any desired elevation, say, 1,000 feet above sea level, and trace that level along the mountain or whatever subject he is studying. The instrument works with photos taken from the ground as well as from the air.

FOOTPRINTS TELL OF ANCIENT LIFE IN GRAND CANYON

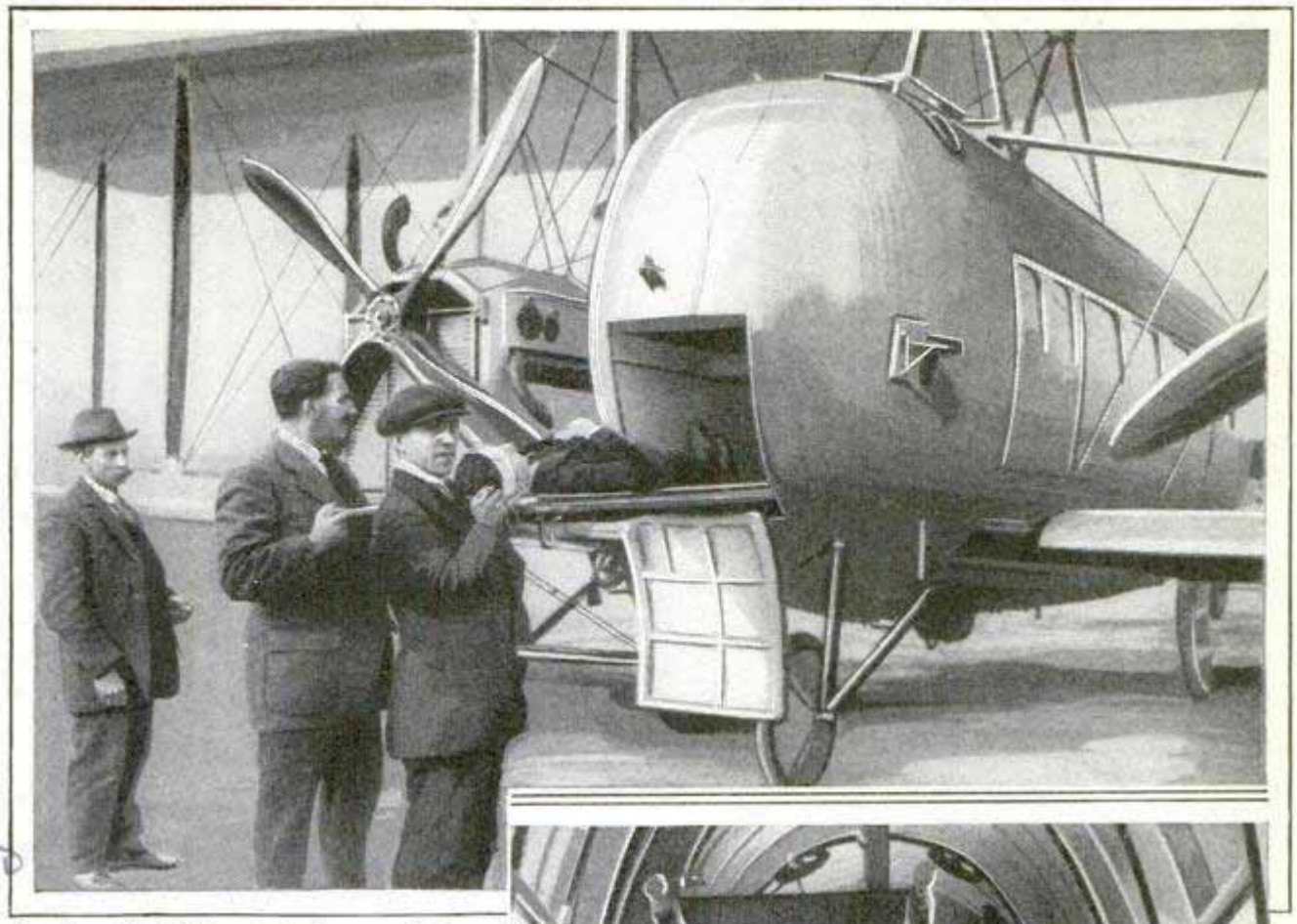
Slabs bearing the imprint of reptile foot marks have been found in the Grand canyon of Arizona, about fourteen miles from the site of previous discoveries of this kind. They correspond with other tracks already uncovered, but further study will have to be made to determine if they match exactly. In all, some thirty-six species of animals that lived many thousands of years ago, have been identified by means of these imprints. An estimate as to their age is made by the character of the soil in which they are found.

CONE-SHAPED ICE-CREAM STAND ATTRACTS MOTORISTS

A conspicuous roadside feature along a motor highway, near Los Angeles, is a refreshment stand shaped like a huge ice-cream cone. Cones exclusively are sold here and, besides affording an attractive display, the booth is well constructed for shelter and to shed rain.



To Catch the Eye of the Hungry Tourist; Refreshment Stand Shaped like Ice-Cream Cone



Loading the Flying Ambulance, and Interior View of the Stretcher Compartment, Showing How It Is Fitted as a Small Hospital

AIRPLANE HAS DOOR IN NOSE TO SERVE AS AMBULANCE

Speedy and comfortable transportation of sick and injured persons from outlying districts is afforded in an airplane ambulance introduced in England. The patient, on a stretcher, is loaded through a door in the nose of the plane and thence back into the cabin where cots are provided. This saves difficult lifting and moving, and the smooth ride through the air is far less likely to injure the sufferer than other means of transport.

SHOES OF OLD AUTO CASINGS GIVE LONG WEAR

Peasants and others in Mexico and Greece have found another practical use for old automobile-tire casings, by converting them into sandals. The demand has become so great that last year, more than 50,000 casings were imported at Saloniki, Greece, alone, because the local supply was insufficient. In Mexico, there are enough automobiles to provide the material. The tire shoes wear from four to six times as long as those made of hide, and also offer better protection against dampness. A durable portion of the casing is cut off, and straps attached and bound about the feet. One tire will make at least three pairs of sandals.

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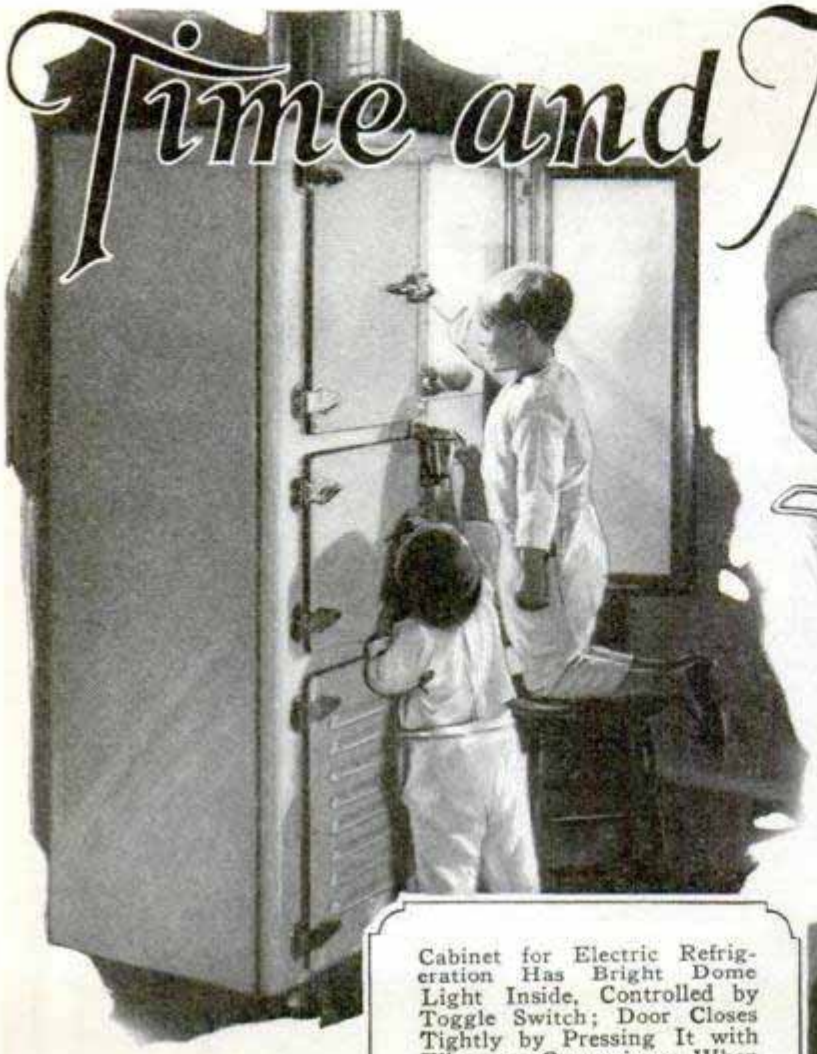
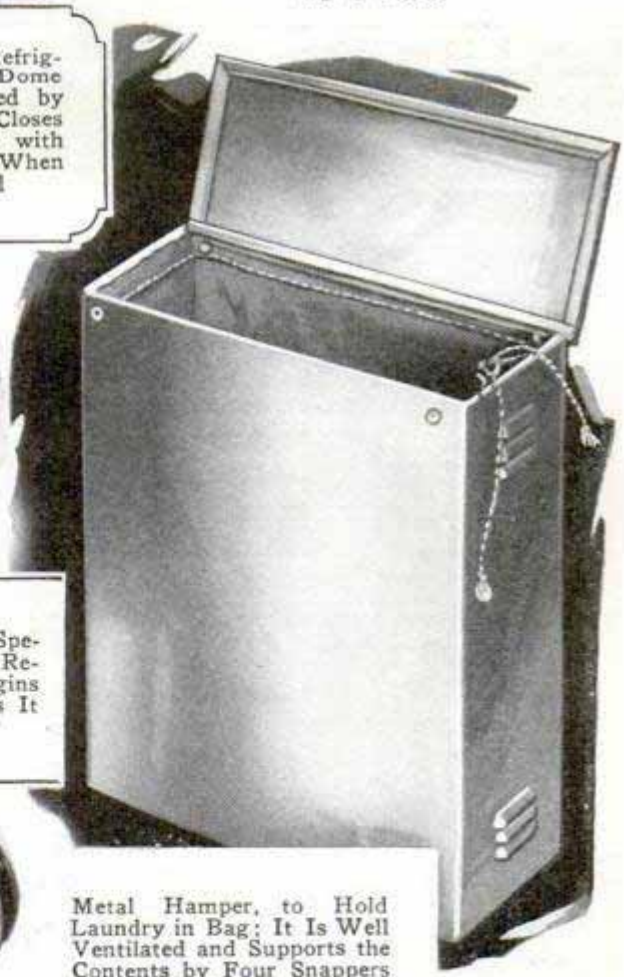
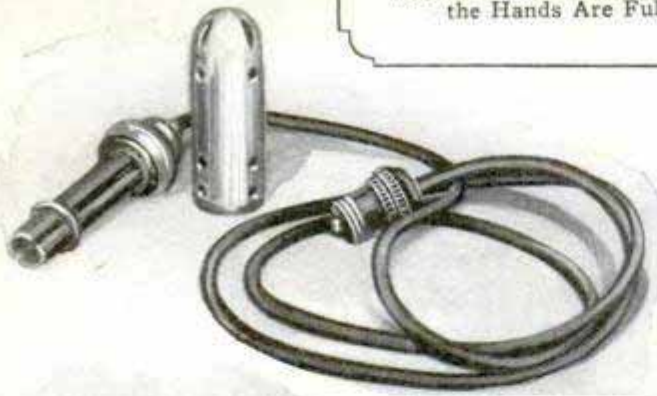
Time and Money



Strainer That Can Be Removed from Its Frame, Simplifies Cleaning and Is Especially Suitable for the Steaming of Foods

Cabinet for Electric Refrigeration Has Bright Dome Light Inside, Controlled by Toggle Switch; Door Closes Tightly by Pressing It with Elbow, a Convenience When the Hands Are Full





Electric Heater of Special Alloy without Resistance Coils, Begins to Heat as Soon as It Touches Water

Rotary Cutter for Vegetables or Meat Is Easily Cleaned by Removing the Clamp and Taking It Apart

Metal Hamper, to Hold Laundry in Bag; It Is Well Ventilated and Supports the Contents by Four Snappers to Simplify Removal

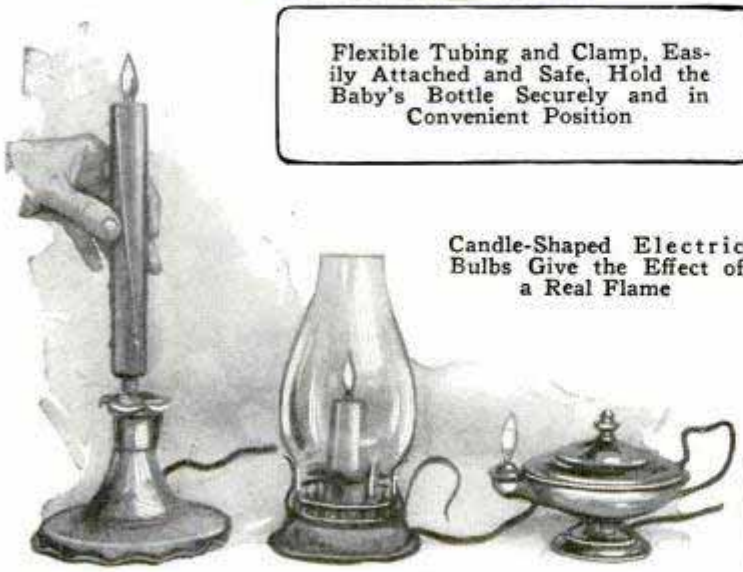
3833.

Saving Things for the Home

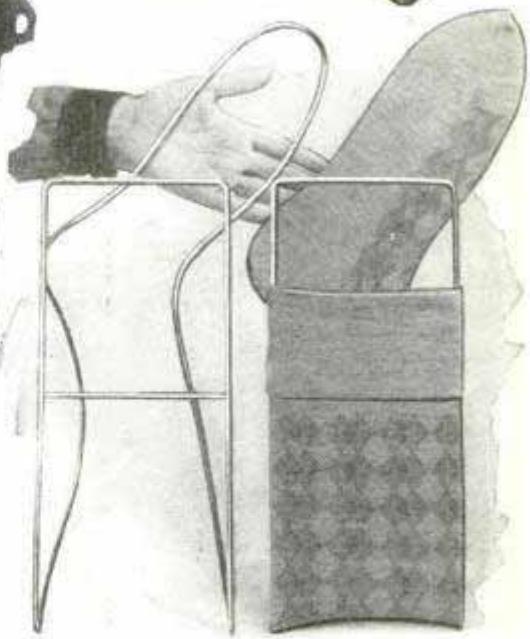
Double Electric Outlet for Table Appliances Is Handsomely Finished and Prevents Tangling Cords

Pot for Boiling or Steaming Has Easily Removable Inner Compartment, to Drain Off Liquids, and Side Handles Simplify Manipulation; It Is Made of Aluminum and Special Lifting Hook Is Furnished

Flexible Tubing and Clamp, Easily Attached and Safe, Hold the Baby's Bottle Securely and in Convenient Position



Candle-Shaped Electric Bulbs Give the Effect of a Real Flame



Drying Racks for Golf Hose Help Preserve the Articles, Keep Them in Shape, Prevent Shrinking and Are Suited to Hang in the Locker

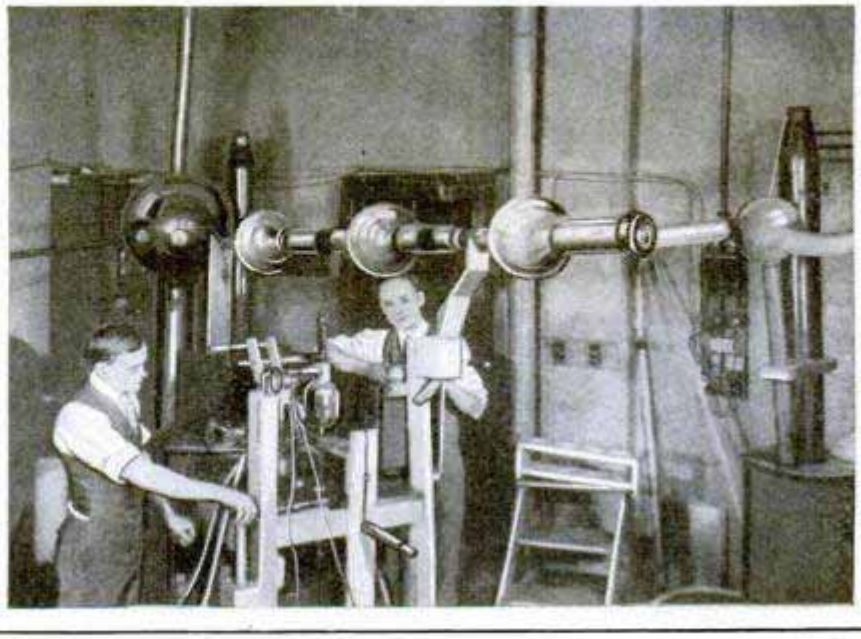
Where Bundles of Paper Money Are Quickly and Accurately Counted by Machine

BANK'S PAPER-MONEY COUNTER SAVES TIME AND LOSS

To count packages of paper currency sent to the federal reserve banks, a sensitive apparatus that sorts certificates with greater accuracy and speed than would be possible with human hands, has been used with great success. Since its installation, it has never made a mistake. It is so adjusted that if two bills are passed through together, the difference in thickness causes the machine to stop. At the end of each 100 count, the apparatus again locks automatically until another package is put in. Bills unfit for further use are sorted and, if there is a shortage or excess number in a package sent to the bank, the fact is always revealed. One of the machines has paid for itself, as any shortage is charged to the bank sending the money.

MAGIC TUBE RAYS EQUAL TO TON OF RADIUM

High-voltage tubes, giving off radiations equivalent to those of a ton of radium, worth $56,000,000,000 at present prices, may be produced in the laboratory, according to Dr. William D. Coolidge, inventor of the X-ray tube now in general use. The prediction follows his successful development of a 900,000-volt cathode-ray tube in which electrons are shot along at the rate of 175,000 miles a second, some 350,000 times faster than an army-rifle bullet. The racing electrons are emitted through a metal window, one ten-thousandth of an inch thick. A lead telephone booth is provided to shelter observers from the strong X-rays produced when the electrons strike a target. This "super-power" tube is ninety-five inches long and has three bulbs, twelve inches in diameter. Electrons, speeding from the first, are accelerated by the introduction of a high-voltage current into the second bulb. The process is repeated in the third, until at the end, the effect of 900,000 volts is obtained. Dr. Coolidge believes that much higher voltages can be used without serious difficulty. It has not been possible to imitate radium radiations with complete success, because of the use of insufficient voltages. The new tube opens a vista of alluring possibilities, Dr. Coolidge declares. He points out that the rays can be controlled, something that cannot now be done with radium, as scientists have no physical or chemical agency that affects either the quality or the quantity of the output of radiations from radium. Chemical, therapeutic and other uses for the rays will be developed, Dr. Coolidge believes.



View of the 900,000-Volt Cathode-Ray Tube; Note the Three Bulbs, Used to Step Up the Speed of the Electrons

Easy Pencil Tricks

By SAM BROWN

FOLKS, let me introduce my friend, Mr. Pencil. "Persistent Graphic," I call him. He has been after me for several months—wants me to give him the leading role in a magical article, promised me he'd keep his long nose out of things and try to be pleasant. Well, I'm human. Sit down anywhere and see how you like his show.

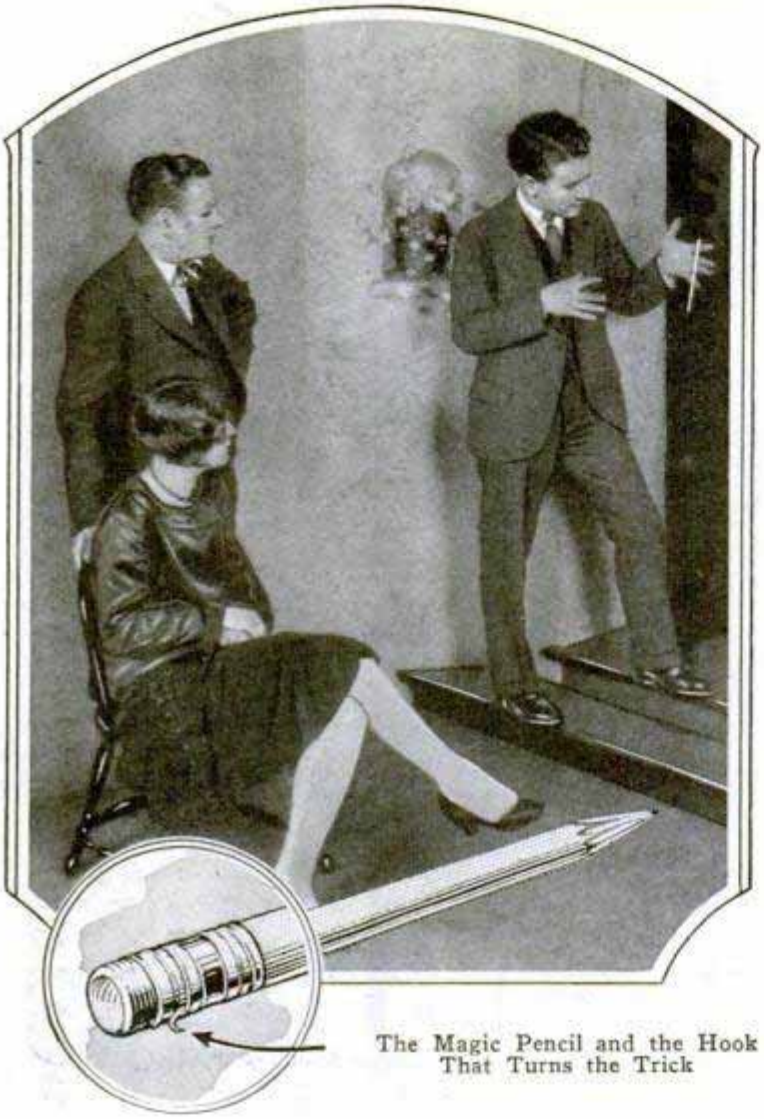
The performer passes out several pencils to the audience. All the pencils are as alike as peas in a pod. Addressing one of the spectators, the performer requests him to initial the pencil he is holding. The pencils are then collected in a hat. The performer is blindfolded.

The trick is to pick out the initialed pencil. It's easier than it sounds. One of the pencils has been previously dipped in perfume. The performer must watch where this pencil goes, and ask the person holding it to mark it with his initials. In placing the pencils, one at a time, to your forehead—psychic stuff—it is a simple matter to pick out the villain by his patchouli breath.

For this next one you must take a knife and raise a tiny projection on the metal end of the pencil, as shown on page 994. Does that suggest a trick to you? No? Listen:

The performer takes his magic pencil. "This pencil," he explains, "is gifted with wonderful magnetic powers. Wonderful . . . magnetic . . . powers."

To prove his point, the performer lays the pencil flat on his hand. He turns his hand over. Does the pencil fall off like an ordinary pencil? It does not! It is the wonderful magnetic pencil. It hangs on! What does it? The little raised projection on the end of the pencil. This catches on the skin, on the clothes, or wherever it is applied, and does the trick.



The Magic Pencil and the Hook That Turns the Trick

After two or three experiments using this tiny hook, the performer drops the pencil on the floor and rolls his foot over it. "This," he states, "is to give the pencil more magnetic power." But, don't believe him! What it really is for is to roll the little hook out flat.

To show how magnetic the pencil now is, the performer makes it cling to his finger tips. Without the hook? Sure! Simply hold it as shown in the photo to the right on this page, pressing down with the second and third fingers and out with the fourth and first.

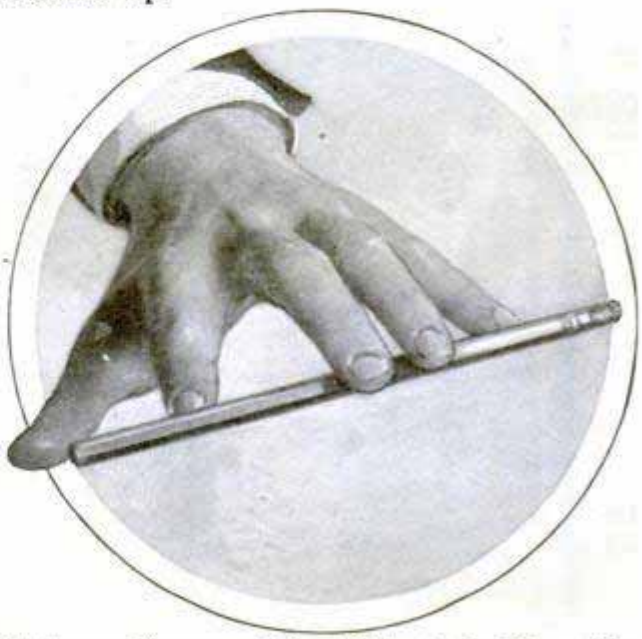
A variation of the magnetic pencil trick, which always mystifies, requires two pencils, exactly alike. Get a pair with plain ends—no erasers or metal caps. Sharpen them to the same length, lay one aside, and you are ready to prepare the other. Take a common pin, cut off a half inch, measuring from the point, and sharpen the cut end, so you have a piece of steel, half an inch long and pointed on both ends. Now bend it about three-sixteenths of an inch from the original point, and, with a small hammer or other weight, drive the newly sharpened end of the longer leg into the top of the pencil, about midway between the lead and the edge of the wood.

Holding the pencil in one hand, cup the other by bending the fingers upward at right angles to the palm. Push the pin point through the loose fold of skin in the palm of the hand, and you are ready for the demonstration.

So long as you keep the fingers slightly bent the pencil will lie flat along the hand, but the moment you start to straighten them out, the fold of skin is stretched taut and the pencil begins to rise.

Here is how the effect works:

"I have here a couple of ordinary pencils with which I can demonstrate the power of static electricity over graphite and wood. I will pass out one pencil and you can follow my motions and prove for yourself that it really works. Place the butt of the pencil at about the palm of the hand—so—and allow the length of it to lie along the fingers. Now rub the other hand briskly over your coat sleeve, just as I am doing, to gather a charge of static. Then pass the hand above the pencil and watch it come up."



Making an Unprepared Pencil Cling to the Finger Tips Is Easy, If the Fingers Are Placed Just So

As you pass the "charged" hand above the other, you slowly straighten the fingers and the pencil slowly and smoothly rises until it stands erect on the palm. As the charge wears out, you can let the pencil down by bending the hand, and then repeat the process. The pencil can be removed at any time, and often can be passed around for inspection without the pin point being detected.

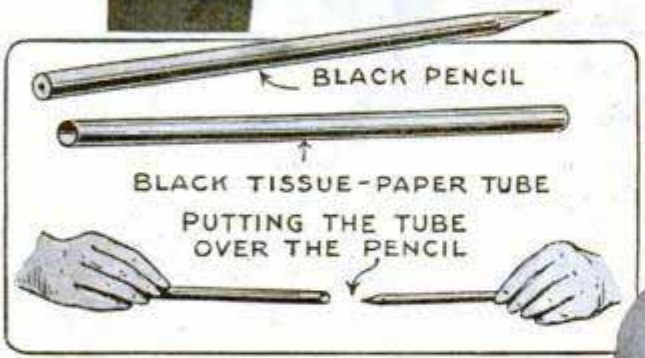
Mr. Pencil is assisted in the next effect by a playing card, and an envelope just large enough to hold the card.

The card is placed in the envelope and the envelope is sealed. The pencil is then thrust completely through the envelope and card and pulled out on the other side. And, yet, when the envelope is torn open, the card is found intact and unharmed! Darn considerate, this fellow, Pencil!

The Pencil Can Be Shoved through the Envelope, at the Left, without Damaging the Playing Card, For the Card Has Slipped Down through the Slit End and Is Concealed within the Palm of the Hand While the Puncturing Is Taking Place

This is simple. Beforehand you must carefully slit open the bottom of the envelope. Now you're all set to go. Place the card in the envelope, being careful not to push it through the slit-open bottom. Not yet. Seal the envelope. Hold it up for inspection. Then take it in the left hand. Allow the card to slip halfway out of the envelope, concealing it with the hand as shown on this page. Do the "Indian Basket" jabbing feature, pushing the pencil through the envelope immediately above the card. Remove the

With a Black Tissue Tube, to Cover the Pencil, and a Pair of Envelopes, the Performer Can Stage a Vanishing Act That Will Mystify the Audience; the Pencil, Slipping Out of the Tube, Is Concealed in a Supposedly Empty Envelope, While the Tube Vanishes into the Wadded Paper Supposed to Hold the Pencil



pencil. Slide the card back into the envelope, and tear the envelope open along the edge that is already cut. Remove the card. And there you are!

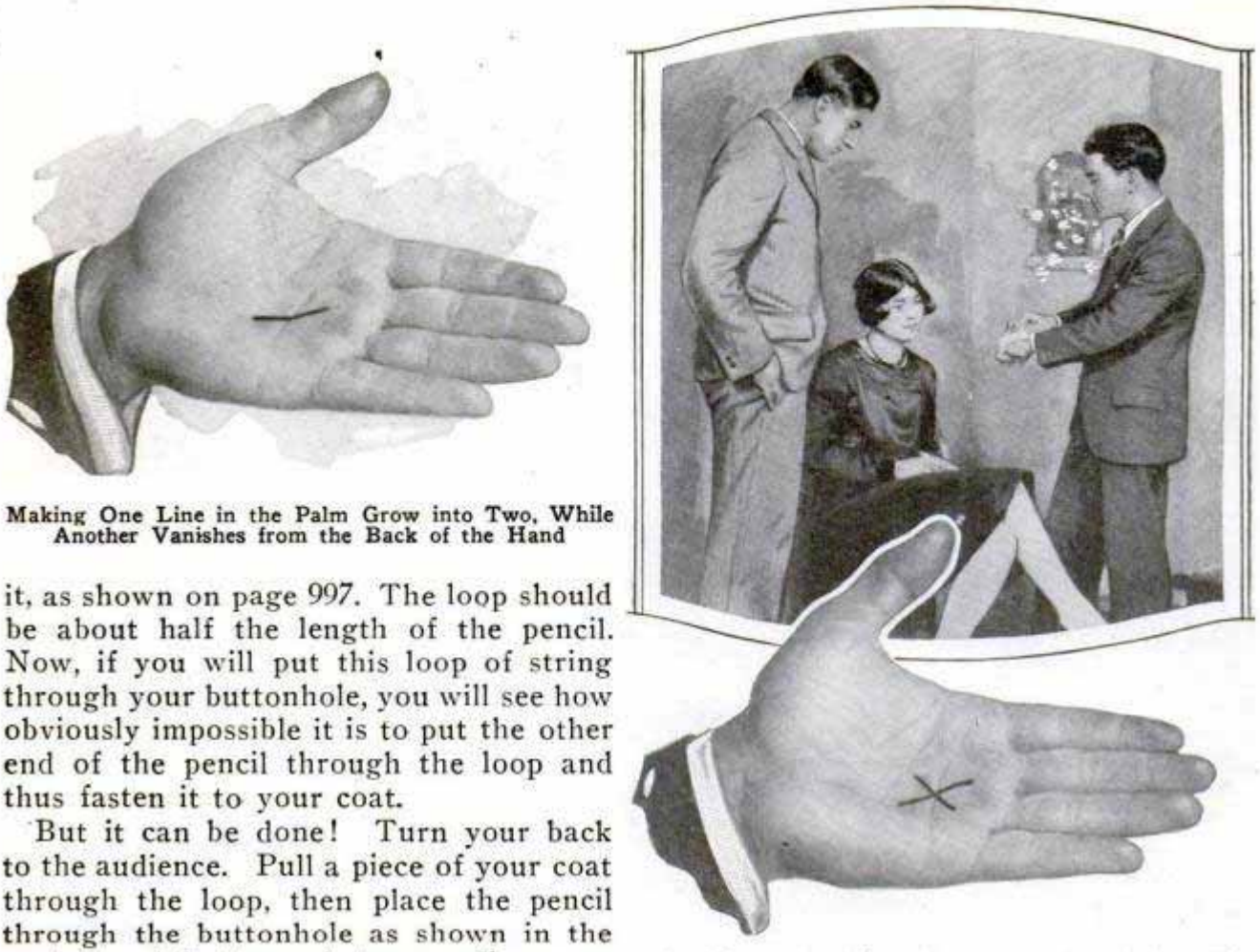
The performer exhibits an ordinary pencil and two long envelopes. One of the envelopes is shown to be empty

Passing a Pencil through a Loop, Much Too Small for It, Is Easy, Once You Learn How the Trick Is Turned

and placed at the far end of the room. Into the remaining envelope the performer slips the pencil. Presto! The envelope apparently containing the pencil is crushed flat in the performer's hands, while the pencil is found intact in the other envelope.

The how of this effect is found in a paper case open at both ends, which fits over the pencil proper, as shown on page 996. Use a black pencil and make the case by wrapping four or five layers of tissue paper around it, and then neatly pasting the outer edge. When you pick up the first envelope, run the pencil around inside to show that it is empty. It is an easy matter, when doing this, to release the real pencil and let it slide into the envelope. The envelope should be of sufficient stoutness so as not to show the outline of the pencil. The case is then dropped into the remaining envelope, and —but why explain further? The crumpled-up envelope is, of course, tossed carelessly away out of reach of the audience.

This next one is called the "Flexible Pencil." Cut a notch around the end of a pencil and tie a short loop of string to



Making One Line in the Palm Grow into Two, While Another Vanishes from the Back of the Hand

it, as shown on page 997. The loop should be about half the length of the pencil. Now, if you will put this loop of string through your buttonhole, you will see how obviously impossible it is to put the other end of the pencil through the loop and thus fasten it to your coat.

But it can be done! Turn your back to the audience. Pull a piece of your coat through the loop, then place the pencil through the buttonhole as shown in the center and bottom photos on the same page. And there you are!

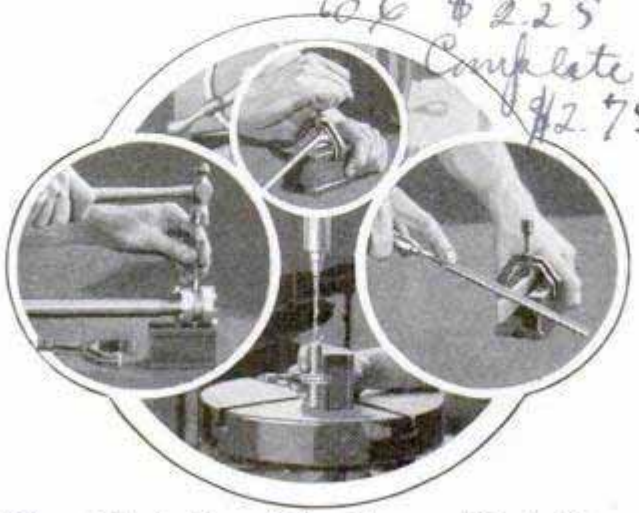
Say, I'd almost forgotten. Pencil's wife, Mrs. Pen, is with him tonight and she's standing over there in the corner all by her lonesome. A wallflower! Say, we can't have this.

The performer borrows a fountain pen. He draws a line on the inside of his hand. He closes his hand. He makes a similar line on the back. Then with a handkerchief he rubs off the line on the back of his hand. But too late; the line has already gone through, and the performer shows the two lines in the palm of his hand.

This one is almost too easy. Make the line on your palm across one of the large creases, as shown on this page. Use plenty of ink. When you close your hand, the line will automatically duplicate itself as shown at the right. The sinking-through business? That's all applesauce!

MECHANICS' CLAMP AND BLOCK SIMPLIFIES SMALL JOBS

Work on small pieces that are difficult to hold is often one of the most bothersome tasks for carpenter or mechanic, but the labor is lightened by using a combination clamp and block recently introduced. It is suitable for home, bench or machine use and is adapted to a wide variety of articles. For instance, it may be employed to hold small pieces of iron for bending, lengths of pipe, rods, flat pieces for drilling holes, and for many other purposes. The unit is of steel and occupies little space in the tool box.



Different Applications of the Clamp and Block, Showing How It Is Adapted to Many Tasks

EGYPTIANS BEST GLASS MAKERS OF ANCIENT CRAFTSMEN

Glass makers of Tut-ankh-Amen's time and before, were the most skillful of all the ancient craftsmen, according to a German professor. He has made a number of tests and analyses of samples of old glass manufactured by the Egyptians and the Romans, down to about 850 A. D., and has found that most varieties had one common fault. There was too much alkali in the mix, resulting in a product somewhat too soft, with lower resistance to corrosion. One reason for this was that the wood-fired furnaces did not develop a sufficiently high temperature without adding high alkali content to get the ingredients to melt together. From early times until the beginning of the Christian era, much glass was used for ornamental purposes and for jewelry. A wide range of colors was available, but the ancients could not make clear glass because they did not know how to remove the impurities.

DISK GRINDER CATCHES DUST AND PROMOTES SAFETY

For grinding a wide variety of small metal or wooden parts, a horizontal disk unit that is portable and operated by an electric motor through a lighting socket, is equipped with a bag at the ide to catch the dust. In addition, it has a convenient support for the arm to expedite feeding, and the edge of the disk is inclosed in a housing for the purpose of safety.

LETTER BOX SINGS AND TALKS TO ADVERTISE AIR MAIL

Equipped with a radio loud speaker, a letter box in Cincinnati sings and talks the praises of the air mail to encourage persons to use the service. The box is placed in a conspicuous position in a public square and attracts hundreds daily.

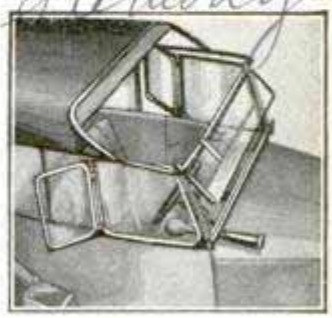
Ringing Bell to Announce That the Golf Course Is Clear; High Trees Make the Signal Necessary

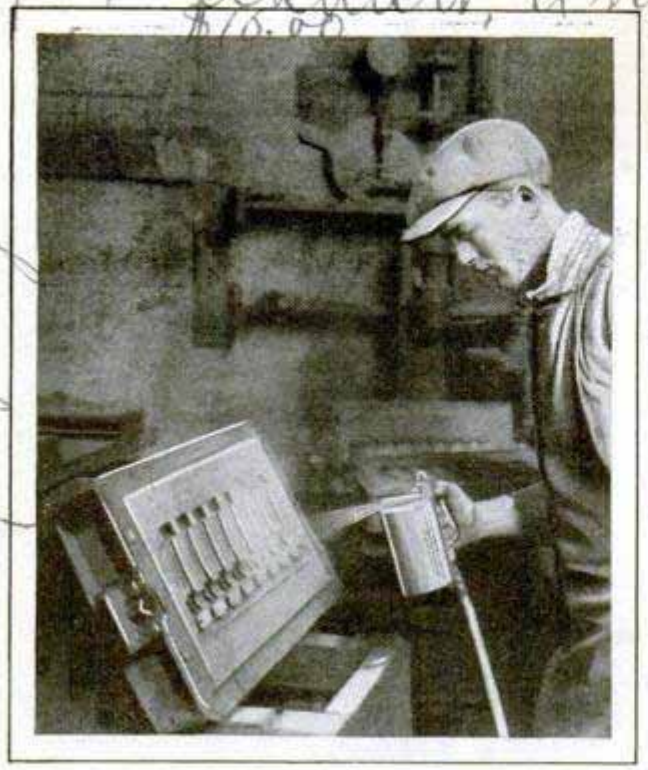
RING BIG BELL ON GOLF COURSE WHEN GREEN IS CLEAR

Players on the golf links in Jasper national park, among the Canadian rockies, are required to use a big-gong signal to inform others when the green is clear at a "blind hole." This is necessary because of the trees that hide the green.

SUNSHINE HOOD FOR AUTO TOPS ADDS PLEASURE TO DRIVING

Fitted to the top of the touring car, a special frame unit has been devised which allows the driver to throw the front part of the canopy back to admit the sunshine. It can be closed as easily, making it unnecessary to shift the entire top. It fits almost any movable top.





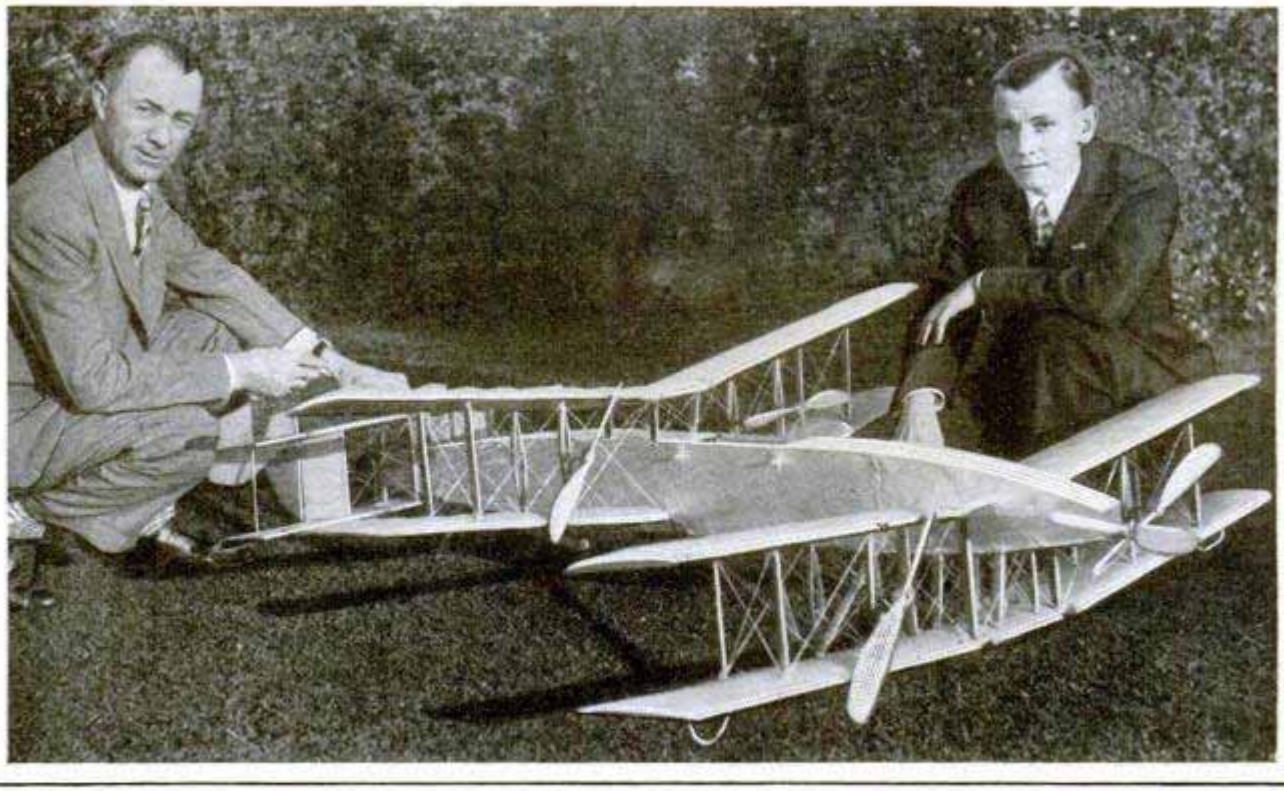
Spraying Mold with Compressed-Air Gun; a More Even Dusting Is Accomplished in This Way

SPRAY GUN FOR DUSTING MOLDS AIDS FOUNDRY PROCESSES

Economy of time and materials is the chief advantage claimed for a spray gun to apply dust to molds in foundry operations. It is similar to the units employed for liquids, being run by compressed air, and is controlled by a squeeze-trigger valve. It is effective at practically any angle, uses various kinds of dust and prevents the formation of defective castings, as it reaches every part of the mold so that burning on of sand is less likely to occur.

FIVE-MOTORED TANDEM PLANE TO CARRY TWO HUNDRED

Tests are being made with a model of a tandem airplane, planned to carry 200 passengers besides the crew, and to make non-stop flights of 13,000 miles and more. It is to be equipped with two sets of wings, five motors, three in front and two on the rear set of wings, and will weigh 72,000 pounds. Tanks for 7,500 gallons of fuel are to be provided. A cruising speed of 100 miles an hour is expected with the five 400-horsepower motors. The inventor has arranged the craft so that it can be converted into a bombing plane in a few hours. As such, it would carry 35,000 pounds in bombs, he declares. An experimental ship to cost $250,000 is proposed, and a trip to Tokyo and Paris from Los Angeles in eight days with a crew of eight men is anticipated. The craft would have a fuselage 116 feet long, and a wing spread of ninety-six feet.



Model of the Tandem Plane, Which, the Inventor Hopes, Will Be Able to Make Long Flights and Carry 200 Passengers; Three Motors Are in Front and Two Behind

Filament Control for A. C. Tubes Eliminates Power Rheostats

An automatic filament-control device, for a.c. tubes of the 226 and 227-types, is now on the market. These tubes are extremely critical as to filament voltage and the control unit will greatly prolong their life. It is designed to compensate for any voltage or current fluctuations, due to inaccuracy in transformer windings, line surge, or overload, that are likely to shorten the life of the tube filaments. Automatic control devices for the standard d.c. tubes are now in general use because of their convenience in eliminating rheostats where possible; the new a.c. unit is required more as an actual protective device. No cumbersome power rheostats, heretofore considered essential for these tubes, are needed with the new device.

Midget Speaker Is Five Inches High

An interesting radio novelty in the form of a midget loud speaker, weighing only a few ounces, has appeared on the market. It is handy whenever small volume is desired and takes the place of headphones in such cases. The speaker also has many possibilities as a means of amusement; being so small, it may be concealed in lamp shades or drawers, under tables and in other places where unexpected talking will puzzle those present.

New Clip-Mounting Resistors Are Wire-Wound

Wire-wound resistors of the clip-mounting type, in values up to 5 megohms, are now available for the set builder. Of sturdy construction, unerring accuracy and ample current-carrying capacity, these units are especially suited for plate-voltage regulation. The fine wire necessary to produce these calibrated units is one-third the diameter of human hair. It is claimed that the resistor cannot possibly break down and will outlive the receiving apparatus in which it is used.

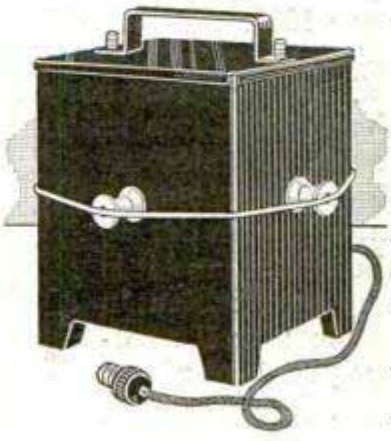
Free-Edge Cone Speaker Installed in Cabinet Designed in Gothic Style

New Cone Has Free Edge

The new speaker shown in the photo employs a free-edge cone or floating periphery, eliminating "nodal" or dead areas. The driver or connecting rod is very short and high efficiency over a wide range of frequencies is claimed for the instrument. Many of the low notes usually lost in speakers of the older types are brought out by the newer types now available, such as those produced by the bass horn, the bass viol and the cello.

Preventing Charger Hum

The usual bulb-type charger sometimes produces a slight hum, especially for the first half hour it is in operation. This may be eliminated by the simple method shown in the illustration. Four wooden spools are placed against the sides as shown, and a wire is drawn tightly around the case over the ends of the spools. This will reduce vibration to a minimum.



The RADIO DOCTOR

by E. R. Haan

SOME UNAVOIDABLE TROUBLES

A LIGHTNING discharge in the immediate vicinity of a radio receiver produces a loud crash in the speaker. More distant discharges produce irregular, frying sounds. This is static. Sometimes the air appears to be entirely void of signals, although no abnormal noises are evident in the receiver. Static, then, intercepts radio signals and prevents them from reaching the receiver. This may be likened to the interception of a light beam by high waves, as shown in the sketch on page 1003. Such conditions may be local, existing in a small territory of a few square miles, or they may cover an area of several thousand square miles. Static is usually more troublesome during the summer months than during the winter, and it is also more evident in tropical and semi-tropical regions than farther north.

Long aerials pick up more static disturbances than short or indoor aerials, or loops. There is really no method of eliminating static at present, although some devices on the market are supposed to do this. However, the effects of static in a receiver can be reduced to some extent by shortening the aerial and connecting a small-capacity condenser in series with the aerial or ground lead. It is also a good idea to use a fixed resistor and condenser across the aerial and ground, as shown in Fig. 1, which will tend to by-pass severe static discharges.

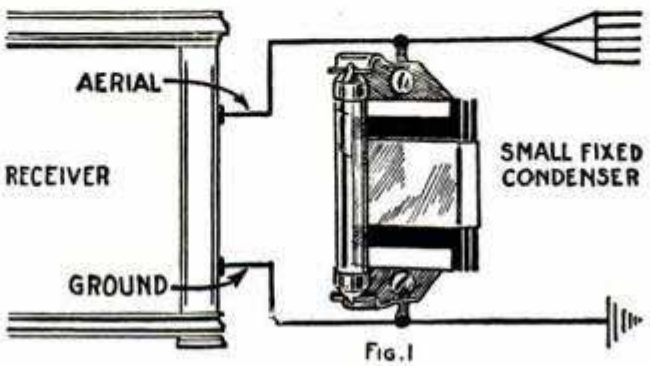
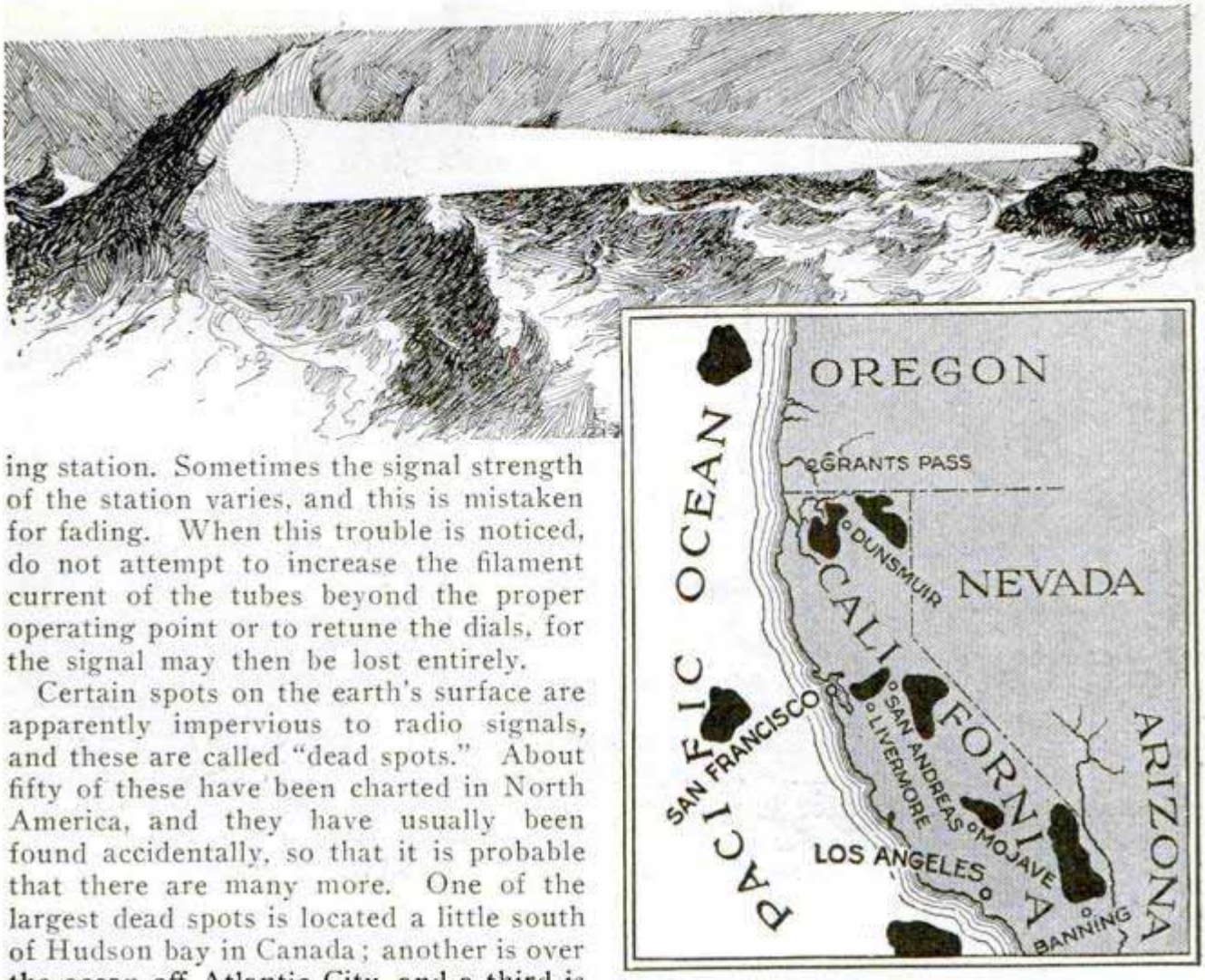


Fig. 1

You may have noticed, when a distant station is tuned in on a receiver, that the signal varies in volume, sometimes becoming almost or entirely inaudible, but finally coming back again to its original volume. This is called "fading," and is caused by varying atmospheric conditions between the receiver and the broadcast-



ing station. Sometimes the signal strength of the station varies, and this is mistaken for fading. When this trouble is noticed, do not attempt to increase the filament current of the tubes beyond the proper operating point or to retune the dials, for the signal may then be lost entirely.

Certain spots on the earth's surface are apparently impervious to radio signals, and these are called "dead spots." About fifty of these have been charted in North America, and they have usually been found accidentally, so that it is probable that there are many more. One of the largest dead spots is located a little south of Hudson bay in Canada; another is over the ocean off Atlantic City, and a third is in the vicinity of Camden, N. J. There are numerous dead spots in Mexico and the southwestern states. A map giving the approximate location of dead spots in California is shown on this page. Radio signals can be received all around these, but the dead areas cannot be penetrated, even when receivers are placed close to their boundaries. These phenomena exist both on land and sea, but the cause of them has not yet been determined.

Sometimes it is impossible, in a certain location, to get reception on a radio set which has been found to work elsewhere, and in such cases it is possible that the particular location of the instrument is shielded from external electrical impulses, and hence the receiver cannot pick up radio signals. This is usually the case when a loop-operated set is installed in a steel-skeleton building. The steel absorbs most of the energy and grounds it. Like effects are often evidenced in receivers located in the vicinity of large deposits of metal in the earth.

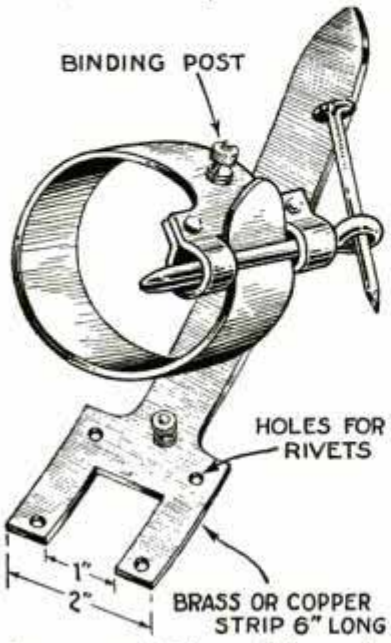
One of the most frequent interference troubles is that experienced from reradiation of regenerative receivers. All receivers, which feed back some of the plate current from one or more tubes into the aerial, either directly, as is the case with the ultra-audion hookup, or indirectly, as is the case with three-circuit tuners, are regenerative. When these receivers are operated improperly, the tubes oscillate and the aerial is charged with a high-frequency current, which is radiated in the air for many miles, and is picked up and amplified by all receivers in the vicinity. This interference causes either a steady howl or a whistle; or, if the tuning dial on the offending receiver is being rotated, "mocking-bird" whistles of varying intensity will be heard in other receivers.

The trouble cannot be eliminated at the receiving end, although it can be reduced to some extent, but it can usually be effectively counteracted at its source.

As a general rule, it is caused by turning up the tubes too high. The use of a non-reradiating unit on the offending receiver is an effective cure.

Homemade Ground Clamp That Grips

Most radio ground clamps are adjustable by means of a screw or bolt, and, in time, will slip or loosen. But the one shown in the sketch, which can be made in a few minutes by anyone familiar with tools, is so designed, that, once in position on the water pipe, it will stay put, insuring a good, tight ground connection. If the clamp is to be used around the usual ¾ or 1-in. pipe, cut a strip of fairly heavy sheet copper or brass, the size and shape indicated in the drawing. The main portion is 1 in. wide and the distance between the two end lugs is slightly more than 1 in. Drill four holes in this part, as shown, and fasten a binding post in the center. When completed, double over the lugs and rivet them together to form loops. Wrap the clamp about the pipe and pass a large steel cotter pin through the loops. Then push the pointed end of the strip through the slot in the pin and turn it down. Push a nail through the eye of the cotter and twist until the metal strap is pulled tight about the pipe. Wire the nail to the pipe to retain the tension, and the result is a permanent ground connection.

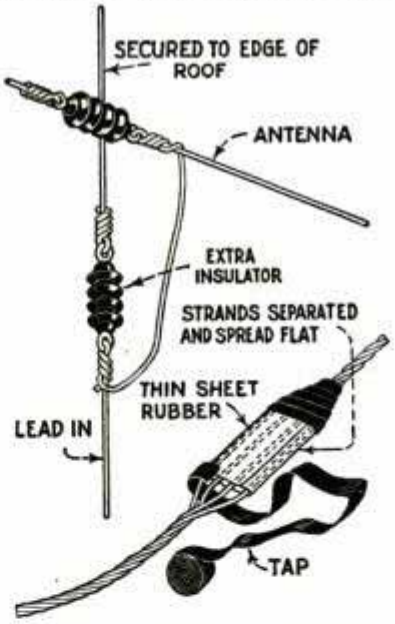


Inexpensive Radio Panels

Ten cents is surely a low price to pay for a good 7 by 16-in. radio panel. Such a panel can be cut from an asbestos shingle, and has been found to answer the purpose nicely. The shingle can be bought from any large lumber dealer, who usually will be willing to cut it to any size wanted. While this panel will require careful handling, it can be drilled easily even in critical places. Shingles may be obtained in several colors, and in contrast to black dials give the panel a pleasing appearance. The dielectric effect is, perhaps, no better than wood for many radio purposes, but as a front panel for experimental sets, asbestos shingles offer a good substitute.

Aerial Kinks

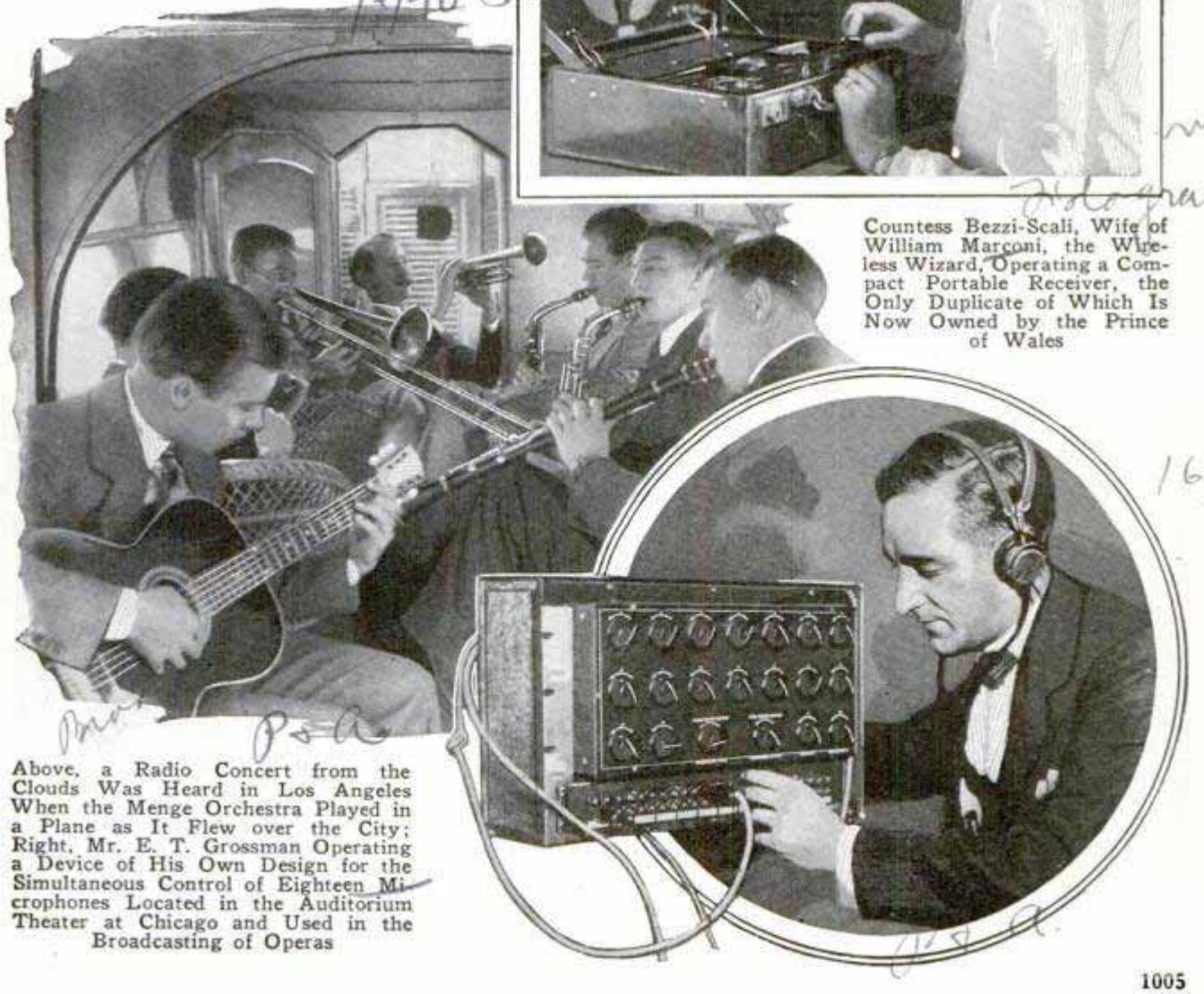
Fading of weak DX-signals is often caused by a swaying lead-in wire from the aerial. It is not a good idea to pull the lead-in wire tight to prevent this, as the strain on the horizontal part of the aerial would be too great, but if an additional insulator is placed as shown in the sketch, the lead-in wire may be strung as tight as the horizontal section without causing any strain on the aerial. The lower sketch shows a simple method of bringing in the lead-in wire without drilling holes in the building. Carefully untwist a few inches of the aerial wire, separate the strands and lay them out flat. Wrap an insulating sleeve made of a thin strip of rubber from an old hot-water bottle, or section of inner-tube, around the wires and fasten it with adhesive tape as shown. The insulated section is then placed on the window sill and the lower sash closed down tight over it. If not too bulky, the strip will not interfere with the closing of the window. Another advantage of bringing in the lead-in in this manner is that no soldered connections are needed. Note that the horizontal portion of the wire in the aerial proper, shown in the upper sketch, is looped through the end of the insulator and the lead-in wire is brought down to the set without cutting it. One continuous wire for the entire aerial eliminates high-resistance soldered connections; good reception of weak distant signals will depend largely on an efficient aerial and ground.



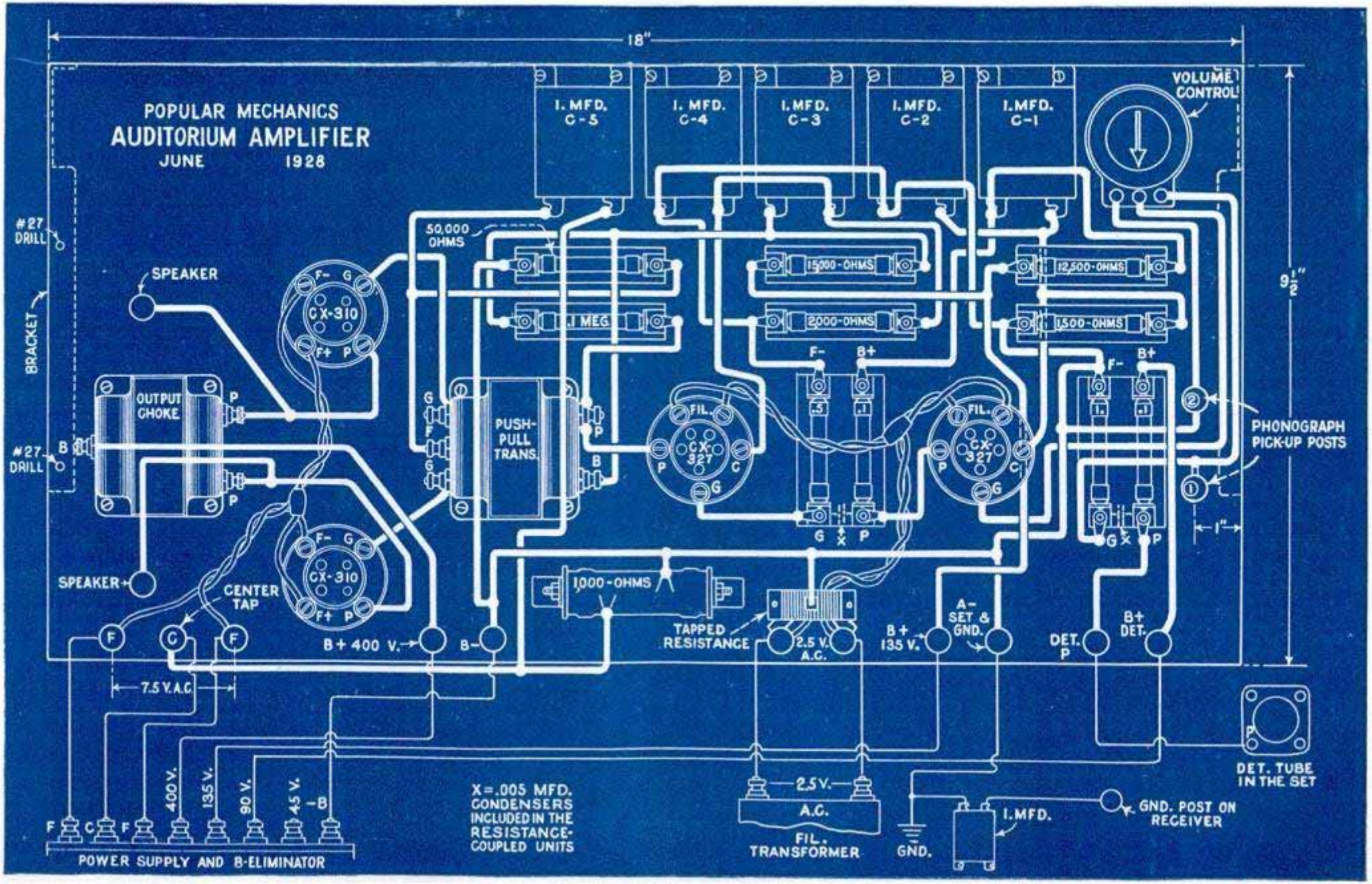
Facts and Fads for Radio Fans

Receiving Radio Pictures on a Small Outfit Located at the Home of Dr. Alfred N. Goldsmith, New York City; the Device Is Connected to an Ordinary Receiver Much in the Same Manner as a Loud Speaker

Countess Bezzi-Scali, Wife of William Marconi, the Wireless Wizard, Operating a Compact Portable Receiver, the Only Duplicate of Which Is Now Owned by the Prince of Wales



Above, a Radio Concert from the Clouds Was Heard in Los Angeles When the Menge Orchestra Played in a Plane as It Flew over the City; Right, Mr. E. T. Grossman Operating a Device of His Own Design for the Simultaneous Control of Eighteen Microphones Located in the Auditorium Theater at Chicago and Used in the Broadcasting of Operas

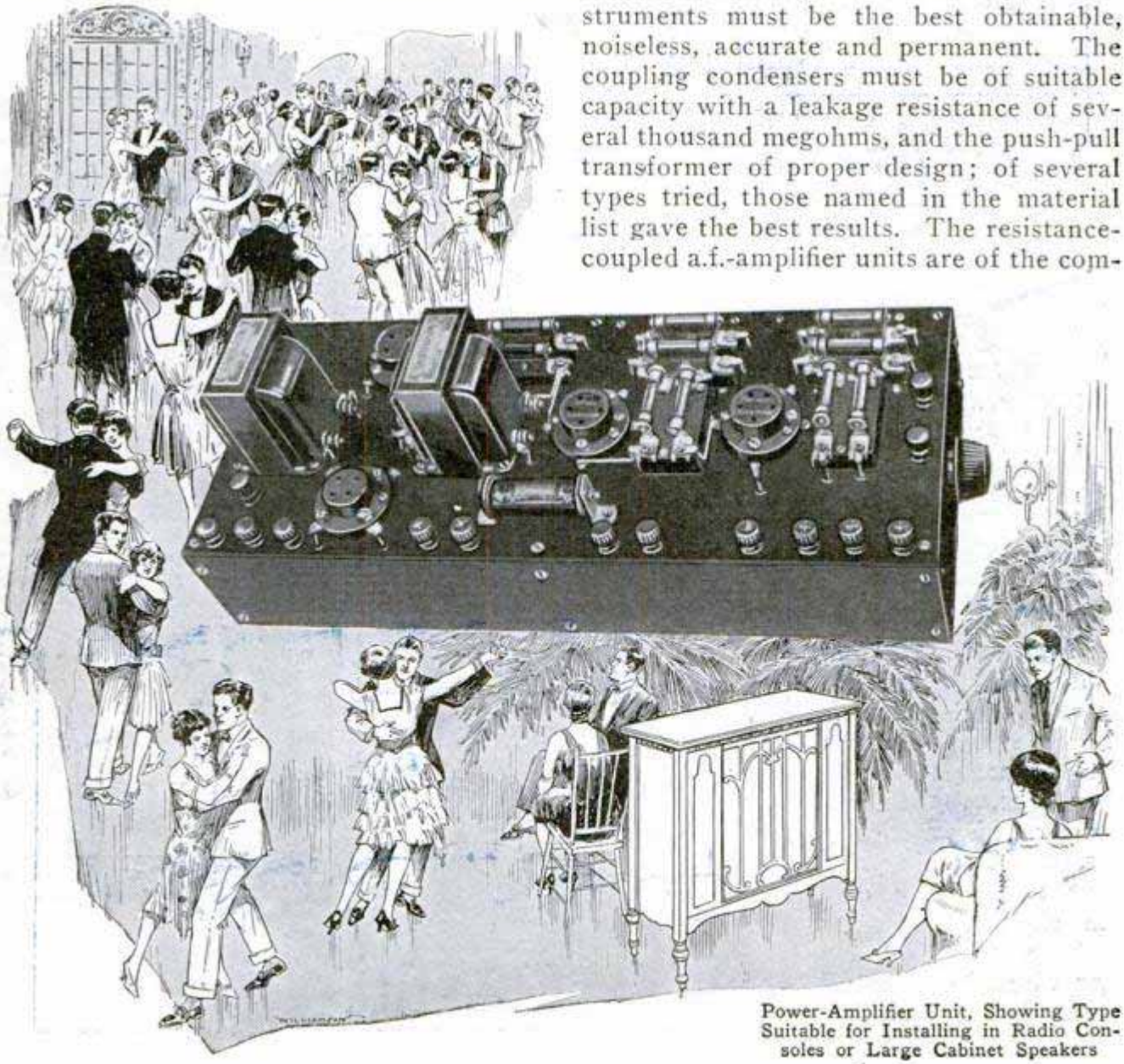

POPULAR MECHANICS
AUDITORIUM AMPLIFIER
JUNE 1928
18"
9½"
1 MFD. C-5
1 MFD. C-4
1 MFD. C-3
1 MFD. C-2
1 MFD. C-1
VOLUME CONTROL
#27 DRILL
BRACKET
SPEAKER
50,000 OHMS
1 MEG.
15,000-OHMS
2,000-OHMS
12,500-OHMS
1,500-OHMS
CX-310
OUTPUT CHOKE
PUSH-PULL TRANS.
CX-327
FIL.
F-
B+
PHONOGRAPH PICK-UP POSTS
1"
1,000-OHMS
CENTER TAP
TAPPED RESISTANCE
2.5 V. A.C.
B+ 400 V.
B+ 135 V.
A- SET & GND.
DET. P
B+ DET.
7.5 V.A.C.
400 V.
135 V.
90 V.
45 V.
-B
POWER SUPPLY AND B-ELIMINATOR
X=.005 MFD. CONDENSERS INCLUDED IN THE RESISTANCE-COUPLED UNITS
2.5 V. A.C.
FIL. TRANSFORMER
GND.
1 MFD.
GND. POST ON RECEIVER
DET. TUBE IN THE SET

Building a Perfect-Tone Amplifier

Ultra-Modern Power Amplifier Furnishes Undistorted Volume for Radio Sets and Phonographs

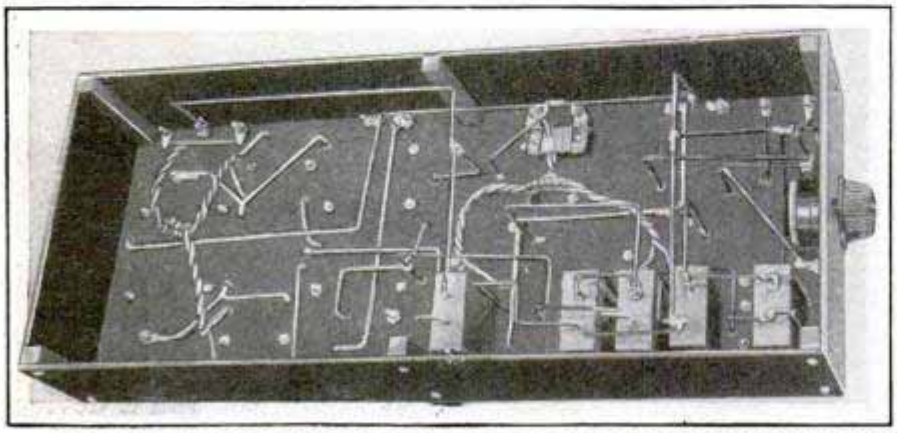
PERFECT tone, at power-amplifier volume, is now available to all owners who are looking for a means of improving their receivers or wish to provide amplifier volume sufficient to take the place of an orchestra for dancing parties. New developments in a.f. amplifiers and efficient socket-power devices have placed this source of reserve power within the reach of every owner. The combination resistance-coupled and push-pull power amplifier, as well as the power-supply and B-eliminator unit, described and illustrated in this article, are the latest ideas in this line for the man who likes to build his own. The power amplifier combines the advantages of a resistance-coupled amplifier unit, used as a voltage amplifier (giving the most uniform response over the a.f. range), with the excellent qualities of a push-pull transformer-coupled power stage. In this circuit the troublesome harmonics generated in the ordinary stage of this type are neutralized and cancel themselves, the two popular types of a.f. amplification being employed in the manner in which each is most efficient.

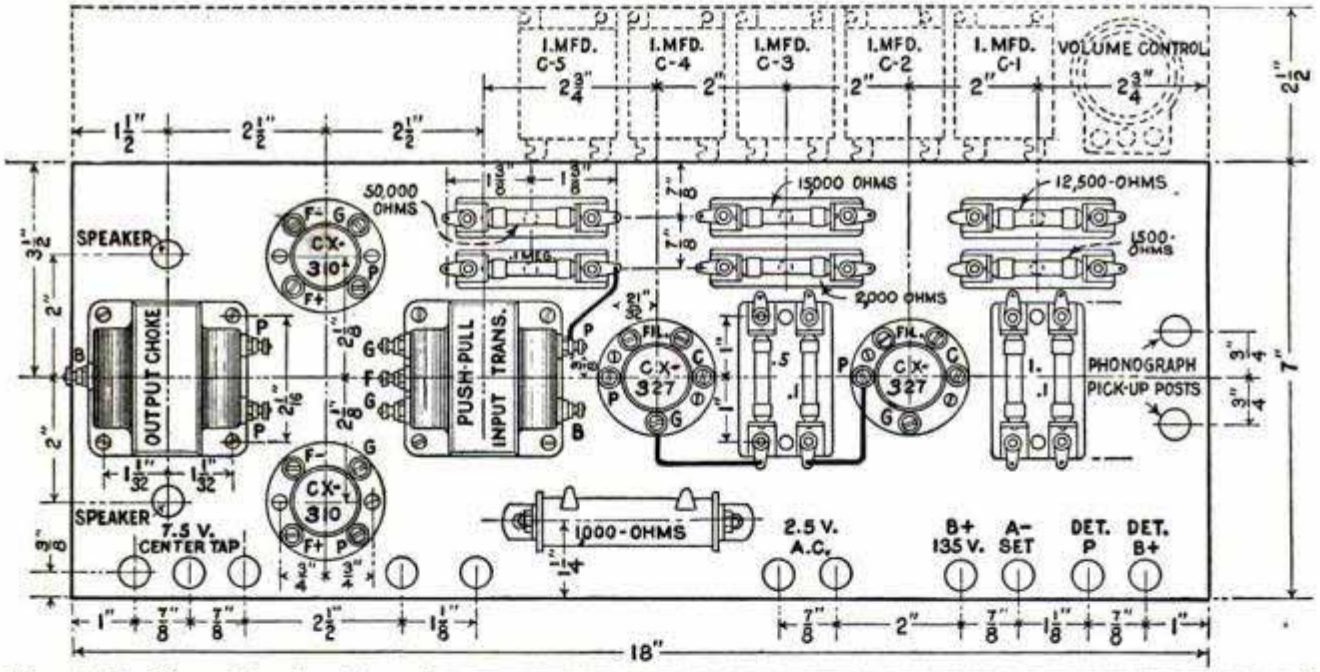
It goes without saying that, in a device such as this, any old resistor, condenser or transformer cannot be used; these instruments must be the best obtainable, noiseless, accurate and permanent. The coupling condensers must be of suitable capacity with a leakage resistance of several thousand megohms, and the push-pull transformer of proper design; of several types tried, those named in the material list gave the best results. The resistance-coupled a.f.-amplifier units are of the com-



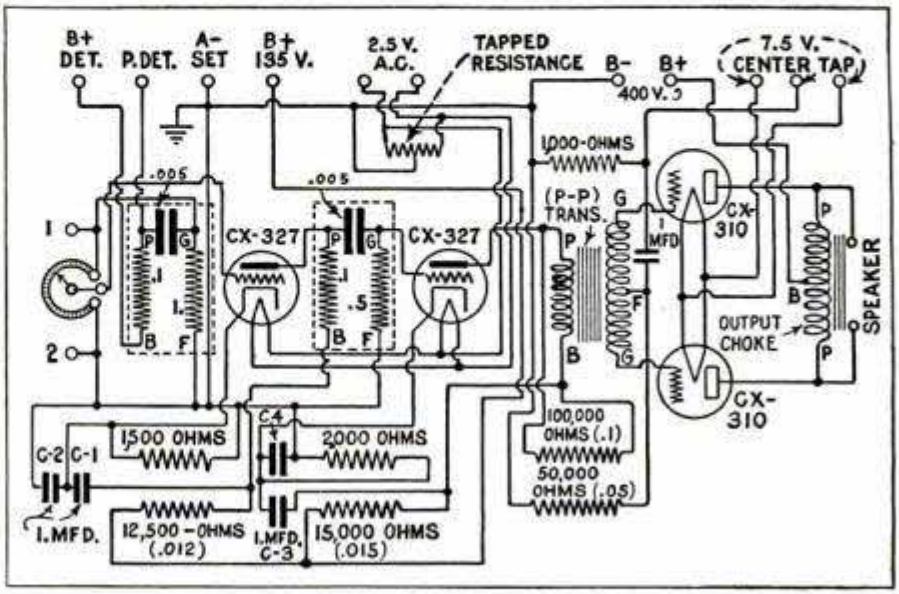
Power-Amplifier Unit, Showing Type Suitable for Installing in Radio Consoles or Large Cabinet Speakers

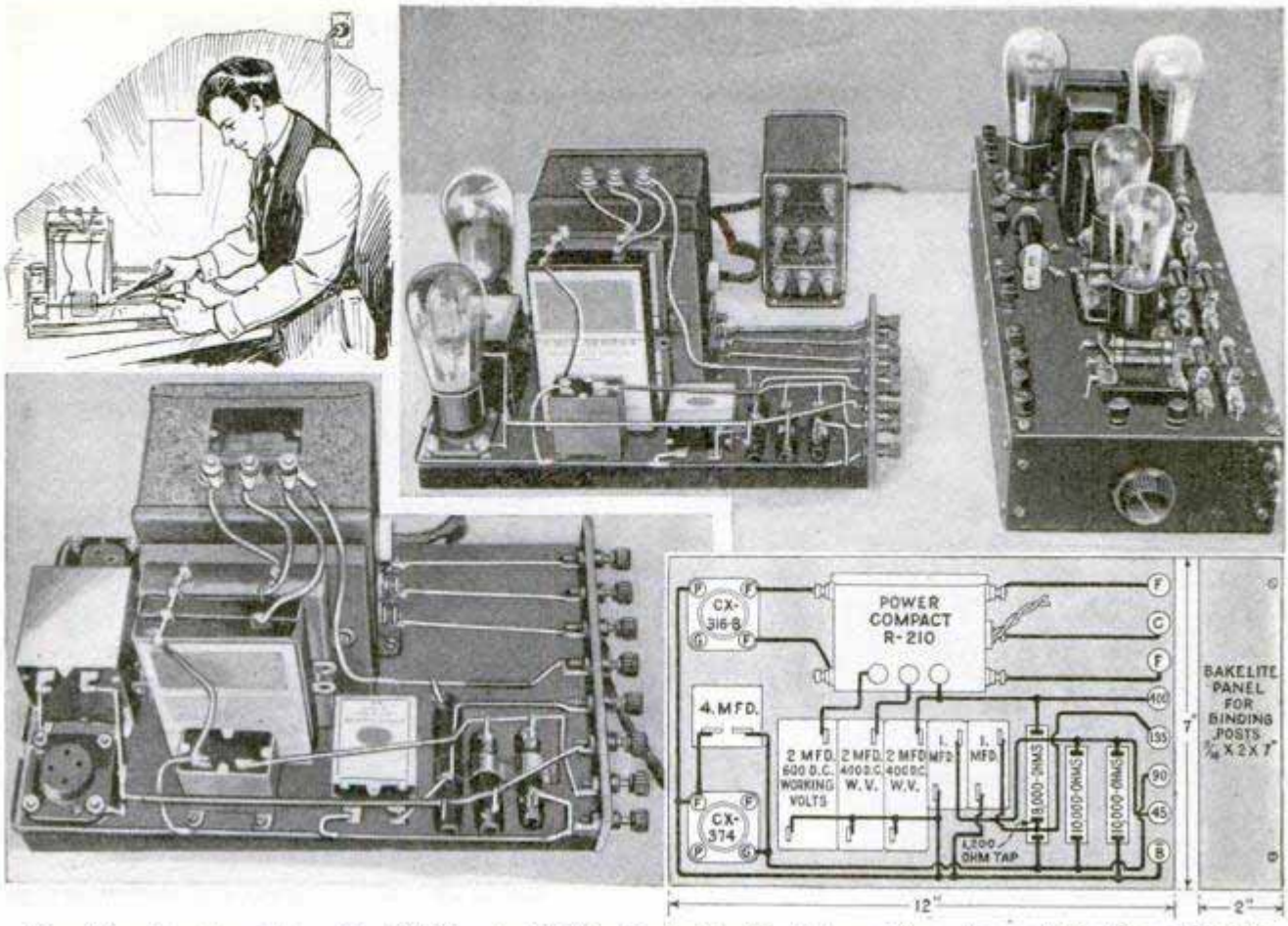
plete-unit type with the fixed condenser already installed. All resistors used in the amplifier are specially selected for their purposes, some being of the wire-wound type; therefore, in this particular item, the builder should follow the material-list specifications closely. The power amplifier may be built in flat, or "breadboard," type, or as a cabinet unit such as the one shown in the photo on page 1007. In either case, the instrument layout is practically the same. The blueprint layout and wiring diagram show the instruments assembled on either a board or a bakelite panel, 9½ in. wide and 18 in. long. If a bakelite panel is selected for this flat layout, use the subpanel brackets suggested, or short wooden dowel pins, to raise the panel so that most of the wiring may be hidden underneath. If the builder desires a cabinet type, the top bakelite panel will be 3/16 by 7 by 18 in. Two side panels, 3/16 by 3 by 17¾ in., two end panels, 3/16 by 3 by 7 in., and six pieces of hardwood, ½ in. square and 3 in. long, are required. All instruments, except the five 1-mfd. condensers and the volume-control unit, are mounted on the top panel exactly as before. The photo of the





Top, Under View, Showing Simple Method of Construction; Below, Top-Panel Layout and Schematic Circuit Diagram





Top, Complete Assembly, with All Tubes in Position Ready for Final Connections; Lower Left, Power-Supply Unit and B-Eliminator, Showing Arrangement of Parts; Right, Diagram of Connections

completed cabinet unit shows the volume control on the panel at the input end. The 1-mfd. condensers are mounted under the top panel, as shown in the underside view on page 1008, but the circuit is wired just as shown in the blueprint in either case. A schematic diagram is also given on the same page for those who prefer it.

The construction of the cabinet as well as of the layout is so clear in the photos and diagrams that little further comment is necessary.

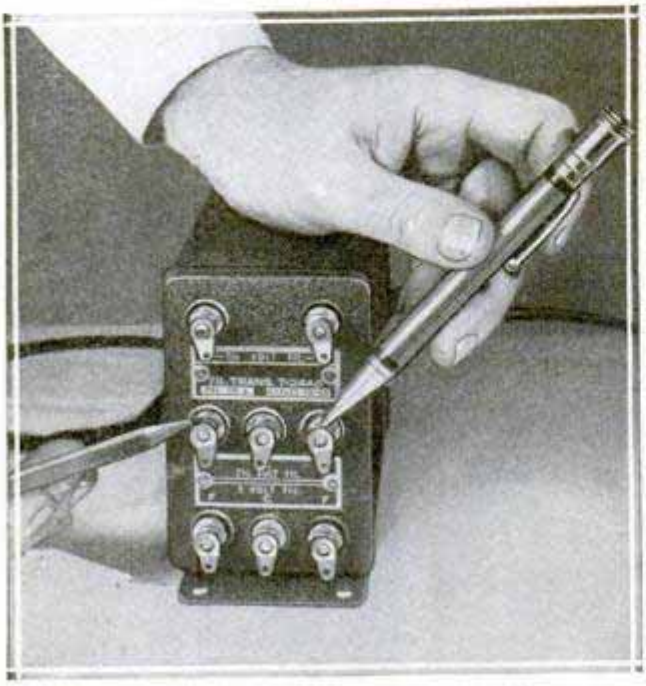
No. 14 round tinned-copper busbar is used for the circuit with the exception of the filament leads, which are standard flexible rubber-covered hookup wire, twisted as shown in the diagram. Tape connections carefully to prevent shorts, and use spaghetti tubing to insulate any of the busbar wiring likely to cause a short.

Now that the wiring of the amplifier unit has been completed, we are ready to give our attention to the power supply. The designer has given a wide range of flexibility to the power-amplifier unit, as it can be used with any radio set, either battery-operated or of the latest a.c. socket-power types, as well as with phonographs. The first two heater-type tubes require 2.5 volts a.c. for the filaments; if the receiver is of the kind using similar tubes, this voltage is already available, but if it is of the battery-operated type, a filament-heating transformer such as shown on page 1010 must be provided. Note that transformers of this type also have terminals for 1½-volt and 5-volt filament supply, so that it is a simple matter to use one of the standard harness arrangements and convert the receiver into the a.c. type if desired.

Any good power pack designed for the UX-210 or CX-310 tubes may be used; the high plate voltage necessary is 400 volts d.c., and a filament supply of 7.5 volts a.c. Ordinarily such power packs are designed for use with only one tube of the 310-type; the one specified in the material list, however, will handle the filament supply for both 310 tubes in parallel without undue heating. The power-supply unit is shown in the photo at the lower left on this page, and the simple wiring diagram is given at the right. The diagram is self-explanatory, as all specifications are given. This unit provides ample

power and is also a B-eliminator, supplying any other plate voltages required in the receiver.

A block of wood is placed between the power pack and the condenser bank as a support, the large, flat condensers being



Filament-Heating Transformer; Pencils Point to the Terminals Supplying 2.5 Volts

bolted upright to this block. When building this power supply, use wire sufficiently heavy to carry the current, and wherever busbar wire or bare wire of any kind is employed, cover it with suitable spaghetti insulation.

Remember that all tubes must be in the sockets before the house current is turned on, and the power-supply unit must not be touched without first disconnecting the house current. Never take a tube out of either amplifier or power-supply units unless the current is turned off; this also applies to the loud-speaker connections, as a very uncomfortable shock may result. The best rule to follow is to make all connections and adjustments while the current is off, and keep the device where small children cannot get at it. A double-output choke is used in the amplifier unit in place of the usual output transformer. Referring to the blueprint diagram, note that the B-negative of the power-supply unit is connected to A-negative of the radio set and also to the ground. Be sure to connect the 1-mfd. by-pass condenser just as shown in the diagram, so that the direct ground is only on the points stated. The ground lead from the receiver must have the 1-mfd. by-pass condenser in series with it as a protection against short circuits, which may occur if both sides of the A-battery are grounded, or when a potentiometer is used for volume control. All necessary negative C-bias for the tubes in the power-amplifier unit are supplied by the resistors, and the plate circuits of stages one and two, being isolated, prevent feedback, oscillation and motorboating. An additional resistor shunts the push-pull-transformer primary, preventing howling, while the CX-327 heater tubes in the first two stages are coming up to operating temperature. The amplifier unit is free from a.c. hum except where the power transformer of the B-eliminator or the filament-heater transformer is located very close to the push-pull transformer; so, keep the fields of these transformers at right angles to each other.

To use this power amplifier proceed as follows: Take the audio tubes out of your set and disconnect the detector B-positive wire from the B-battery or the eliminator. Run a wire from the plate of the detector-tube socket to the binding post, marked detector P, on the amplifier unit. Now run a wire from the B-battery or B-eliminator, using positive 90 volts on the detector B-positive post of the amplifier, and run a lead from the B-positive 135 volts to the 135-volt post on the amplifier. Make the other connections, such as ground, a.c. filament-voltages, and 400-volt supply as shown. Keep the speaker cord away from the input; if it is possible easily to disconnect the P-side of the transformer in the set from the detector plate, it is advisable. A spade soldering terminal under the P-binding post of the detector-tube socket will make a quickly detachable connection for the flexible lead going to the detector P-post on the amplifier unit. Note that when connecting the power-supply unit and filament-heating transformer to the 110-volt, 60-cycle, a.c. house-lighting supply, only one plug connection is necessary. Plug the power-supply unit into the socket provided at the rear of the small filament-lighting transformer and then take the lead from this transformer and connect it to the wall plug.

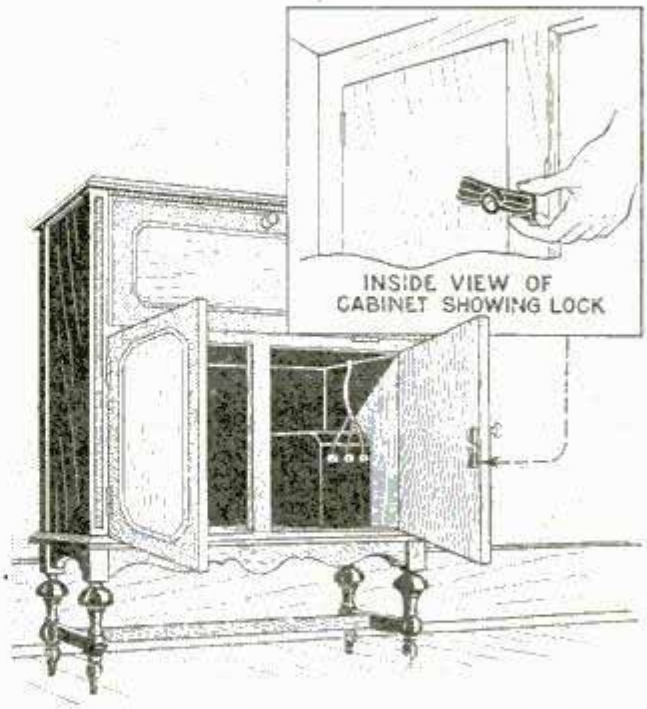
When the power amplifier is to be used for phonographic reproduction, the B-

positive detector and detector P-posts on the unit are not connected to the set or to the B-supply, but all other posts are left connected just as shown. Place a magnetic pick-up device on your phonograph and connect it to the posts marked phonograph pick-up on the amplifier. The needle of this unit is placed on the record in the same manner as the usual tonearm. Keep the cord of the magnetic pick-up away from the loud speaker, or distortion will result, caused by feedback between the input and output.

Surprisingly little trouble will be encountered in building this power-amplifier device, if the wiring is carefully spaced to prevent interaction between the various circuits. One important point to watch is the socket contacts, which should make perfect connection with the tube prongs. It is a good idea to bend the socket contacts together slightly before mounting the sockets on the panel, as a poor high-resistance contact will cause no end of trouble and is hard to locate. Poor contacts cause oscillation and ruin quality.

The builder will feel well repaid when he hears the tone quality and volume delivered, and the designer believes that he is safe in saying that the amplifier will not be out of date for several years to come, as probably the only important improvements will be in better tubes and speakers. While on the subject of speakers it is well to mention that a power-amplifier device of this type will give the best results on horns of the exponential type, with an air column of 5 ft. or more, or when used with the new small type power-speaker cones. If the builder is not interested in obtaining quite as much volume and power, the 171A-type of power tube may be substituted for the 310-type, and the only change necessary is to supply 5 volts a.c. instead of 7.5 volts for the 171-tube filaments and use B-batteries or a B-eliminator delivering from 180 to 200 volts.

The complete list of materials used in the original model will be mailed to any address without charge, a postal will bring it to you. A large blueprint of the circuit diagrams and layouts may be obtained for 25 cents, to cover cost of mailing and packing. Address Popular Mechanics radio department, 200 E. Ontario st., Chicago. Specify blueprint No. 133.



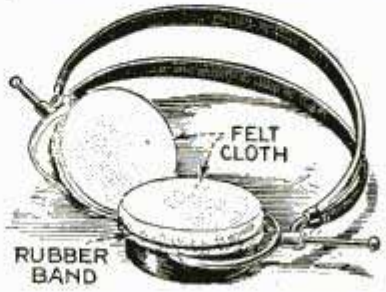
Radio Console Showing Battery-Compartment Door Open and the Location of the Safety Lock

Hidden Lock for Radio Console

The use of B-eliminators and power amplifiers requiring high voltage and exposed wiring, often leads to severe shocks to the uninitiated who tamper with them. Small children especially almost always will investigate what they do not understand, and therefore I devised the hidden lock shown in the sketch. It is merely a wooden turnbutton screwed to the back of the power-compartment door, so that, when rotated, it will extend behind the center brace. To open or close this door, the hand is inserted through the other door as shown.—Harry G. Schultz, Astoria, Long Island, N. Y.

Comfort Pads for Headsets

Radio listeners who use headphones often experience sore ears caused by the pressure of the hard bakelite surfaces when the phones are used over long periods. Soft cloth pads, fitted over the phones, as shown in the illustration, and held in place with rubber bands, offer a simple relief and absorb moisture that might otherwise corrode the metal diaphragm.



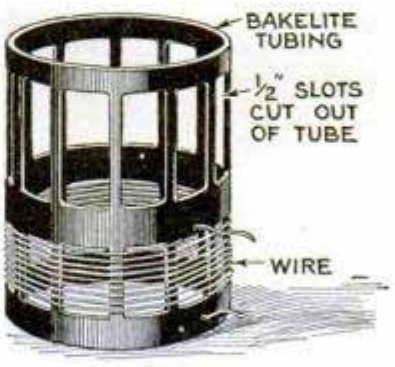
THESE valuable kinks have been written especially for Popular Mechanics Magazine by prominent radio experts. They represent not merely ideas, but practical advice from the best technicians in the profession on methods that will help make your set more efficient in operation, more convenient to handle or easier to build.

Cone-Speaker Kinks

Most speakers of the cone type employ a holder or setscrew, with a small driving wire which runs from the actuating member to the cone through a bushing. If this rod or wire is not in the exact center, the cone will not reproduce as it should. Tune in a good loud signal and loosen the setscrew; if the wire centers, there will be little or no rattling of the cone diaphragm. If it is out of line, as indicated by the heavy vibration against the bushing, it may be centered by removing the screws holding the speaker unit and turning the latter until the rod centers, as shown by the cessation of the vibration; the screws are then retightened. The setscrew at the front is also tightened, and the result will be a much better reproduction. An output transformer between the set and speaker will greatly increase the handling range of the latter, as well as protect its delicate windings from the high-voltage d.c. current of the B-supply. There are times when a damping effect will prove desirable. This may be obtained by wrapping several layers of tape on the driving rod. An easier method is to tape a small weight on the end of the driving rod, at the point of the speaker.—Peter Gioga, engineer, Station KSMR, Santa Maria, Calif.

Forms for Low-Loss Coils

When winding coils on bakelite tubes, greater efficiency can be obtained by cutting slots in the tubes. These slots are ½ in. wide and may be cut with a sharp knife, razor blade or a scrollsaw. No binder is then necessary, as the edges of the slots hold the wire in position. Space the slots about ¼ or ½ in. apart and make them as long as the coil to be wound; if two coils are to be wound on the same tube, two sets of slots are cut.—Herman R. Wallin, commercial radio operator, Brooklyn, N. Y.

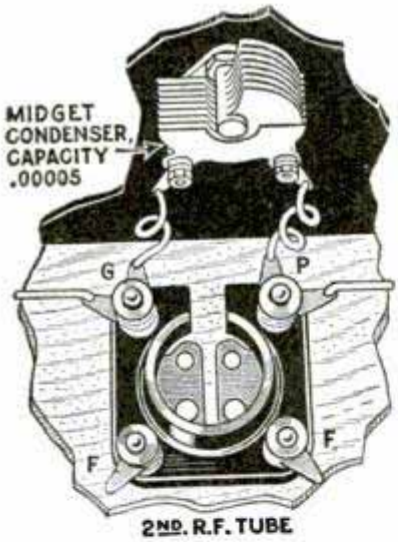


Spreaders for Cage Aerials

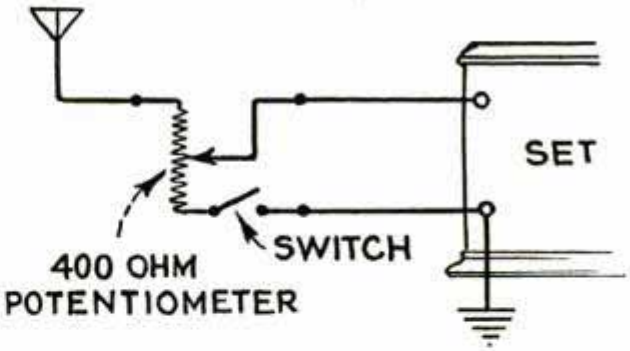
Quite often the radio listener is tempted to make a cage aerial but does not know what rings to use. I have discovered that Fordson-tractor transmission oil rings may be used for this purpose, and they are available even in the smallest towns. The part number is S-345. They are thin steel plates, 5 in. in diameter, easily drilled and very light in weight. If the aerial is to be very long, the rings may be doubled at the ends, where the greatest strain will be. The rings are spaced 10 ft. apart, and each ring is drilled for the number of wires decided on by the builder. If a three-wire cage is desired, space the holes 5⅜ in. apart around the circumference of the rings; for a six-wire cage, the holes are spaced 2½ in. apart.—E. Dale Trout, director, Station WLBQ, Atwood, Ill.

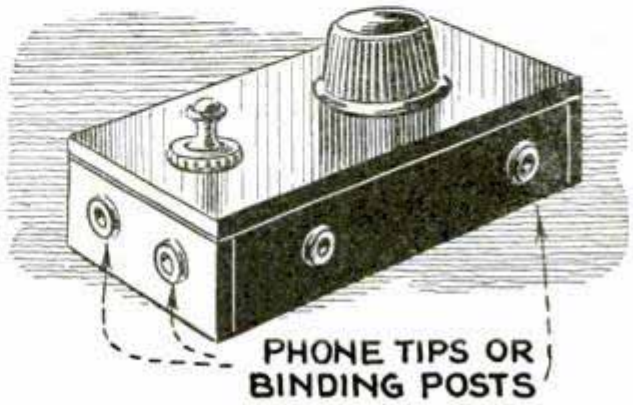
Increasing Sensitivity in Tuned R. F. Sets

Many of the tuned r.f. receivers now in the hands of radio fans are extremely sensitive at the lower end of the wavelength scale and often squeal so hard that it is necessary to turn the sensitivity control far down. These sets, above 350 or 400 meters, are apt to lose sensitivity so that they are almost useless. This latter condition may be corrected by connecting a small variable condenser with a maximum capacity of 40 or 50 mmf. from the grid to the plate of the second r.f. tube. This will cause the receiver to oscillate more easily, and, therefore, can be used only as a regeneration control at long wavelengths.—Bert E. Smith, engineer, Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y.



¶Popular Mechanics' radio department offers its information service free to all readers of our magazine.





Above, Circuit Diagram; Below, Bakelite or Wood Box for Instruments with Pin Jacks for Connections

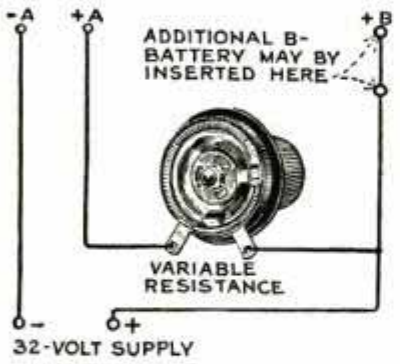
Homemade Volume Control

The sketch and diagram show a volume-control device that can be built by any amateur; the principle is that of a voltage divider, and it will introduce no distortion in the receiver. The tubes work at their specified voltages and are in no way disturbed by the control unit. The diagram above shows the simple circuit required and the sketch below indicates the suggested method of inclosing the device and providing jacks for quick connections to the set. The switch is of the push-pull type and is required when DX-signals are desired. For distant stations the switch is opened and the potentiometer arm is moved to the aerial side. In this position, the volume control has no effect upon the receiver. With the switch closed, the operator can control the reception from a whisper to full volume by adjusting the potentiometer arm.—E. Stuart Capron, engineer, De Luxe Radio and Equipment Co., Buffalo, N. Y.

Battery Supply from Farm-Lighting Plant

The practice of using a six-volt block of the farm-lighting battery as the radio A-supply is not good unless the cells are shifted from time to time. If the same cells are used continuously, the block will

either be undercharged or the remainder of the battery overcharged. This systematic shifting is a tedious procedure and is seldom attended to. The diagram shows how it is possible to provide the same discharge rate on all the cells and at the same time obtain approximately 26 volts of B-battery supply. If five standard ¼-amp. tubes are used in the set, the variable resistance should be 50 ohms, of 1.5-amp. capacity. The filament rheostat in the set is then cut out entirely and the variable resistance is used to control the tube filaments. Additional B-battery units may be connected, as shown in the diagram, if desired. The energy consumed by the use of this method is only 40 watts, and the entire light-plant battery unit is discharged at the same rate.—H. F. Olson, State University of Iowa, Iowa City.

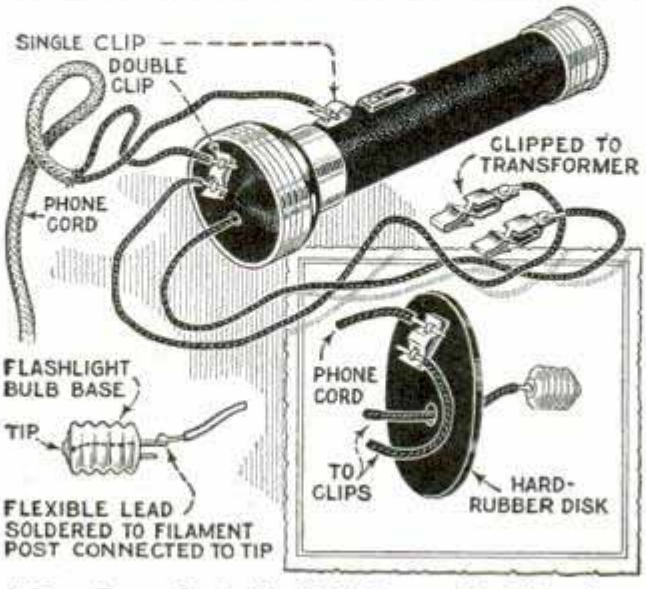


Caring for the A-Battery

While the possession of a trickle charger is of advantage, it does not mean that the storage battery may be neglected. In fact, it should have more attention, as most low-rate chargers have no provision for varying the rate of charge. As a result, the battery is often overcharged, or, in a few cases, slightly undercharged. A case where the battery was overcharged came to my attention when a trickle charger was hooked up to a battery supplying a standard five-tube set and then left unattended in a remote corner of the basement. The battery was continuously overcharged for weeks, and the result was that the battery had to be sent to the shop for a new set of separators and some plates. A storage battery reaches full charge at a specific gravity around 1,300, and at this point the acid becomes active and begins to attack the plates and separators. For best results, the battery should be alternately charged and discharged; in other words, it should not retain the same gravity reading over a long period of time. This may be avoided by hydrometer checking and charging periods so regulated that the battery is kept at a regular charge and discharge rate within a good operating range for the set. Disconnect the trickle charger for a short time each day or week, increasing the time that it is left disconnected until you find that you are occasionally bringing the battery down to about 1,150, below which the operation of the set will be impaired. Attention to the storage battery will save repair bills and lengthen its life.—John B. Eccles, chief engineer, Station WJR, Detroit, Mich.

Flashlamp Makes Pocket Tester

A neat little tester for condensers and transformers can be made as shown in the accompanying illustration. All that is needed is an old flashlight and a few parts that can usually be picked up about the bench. Remove the lens and its ferrule from the flashlight and take out the bulb. Break the glass from a burned-out bulb and dig out the wax around the filament posts. Then find the one connected to the tip in the center of the tube base and solder a flexible lead to it. Cut a disk of hard rubber the same size as the lens. Drill a hole near the center and fasten a double Fahnestock clip at one side. Run the bulb-base lead through the hole and then reassemble the flashlight as before but with the rubber disk in place of the lens. Lastly,



A Neat Tester Is Easily Made from a Flashlight Case, a Burned-Out Bulb and Some Scrap Parts

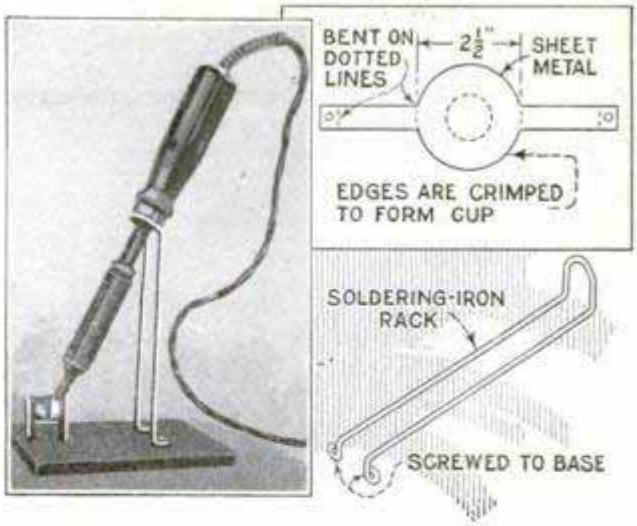
solder a single-contact Fahnestock clip to the metal shell of the flashlight, ahead of the switch. Fasten a spring clip to the flexible lead from the disk and another to a second wire attached to the double clip. Then attach the phone cords to the two spring clips as indicated. With batteries in the shell, the tester is completed and ready for use. Simply attach the spring clips to the transformer or condenser posts, put on the headset and press the switch. The absence or presence of a click in the phones will indicate the condition of the part.—L. B. Robbins, Harwich, Mass.

Twin Cone-Speaker Unit

The twin cone-speaker unit shown in the photo is now available for use in cone and balsa-wood speakers. In construction it differs from the usual speaker unit in that it employs a balanced armature. It is claimed to be unusually sensitive and to work well under the heaviest loads without any adjustment or attention. The unit is easy to mount in any speaker of the large cone or similar type. A 6-ft. cord is provided terminating in the usual cord-tip plugs; only two small wood screws are required to mount the unit in the speaker frame. This simple type of mounting provides an easy method of adjusting the thrust pin of the unit in order to obtain the best results.

Simple Wire-Tinning Device

It is often necessary to tin the ends of wires when building a radio set, and this is rather awkward with the usual tools. The simple device shown in the sketch provides a quick method of doing the job and costs practically nothing. A piece of sheet metal is cut as shown, then crimped and bent to form a small cup. This cup is mounted either on a block of wood or on short metal brackets. The wire stand



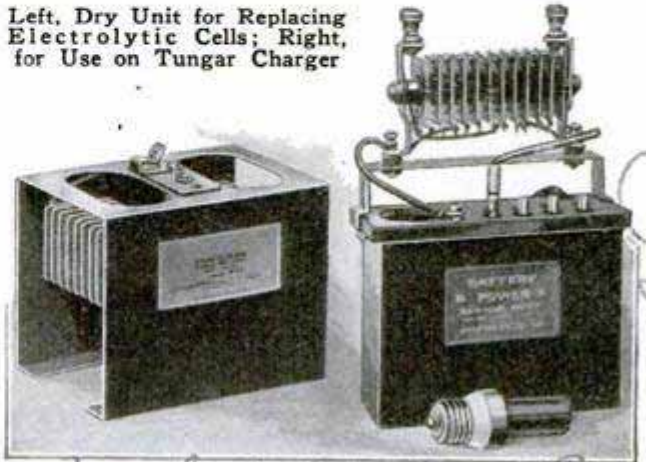
Left, Completed Device; Right, Details of Cup and of Soldering-Iron Holder

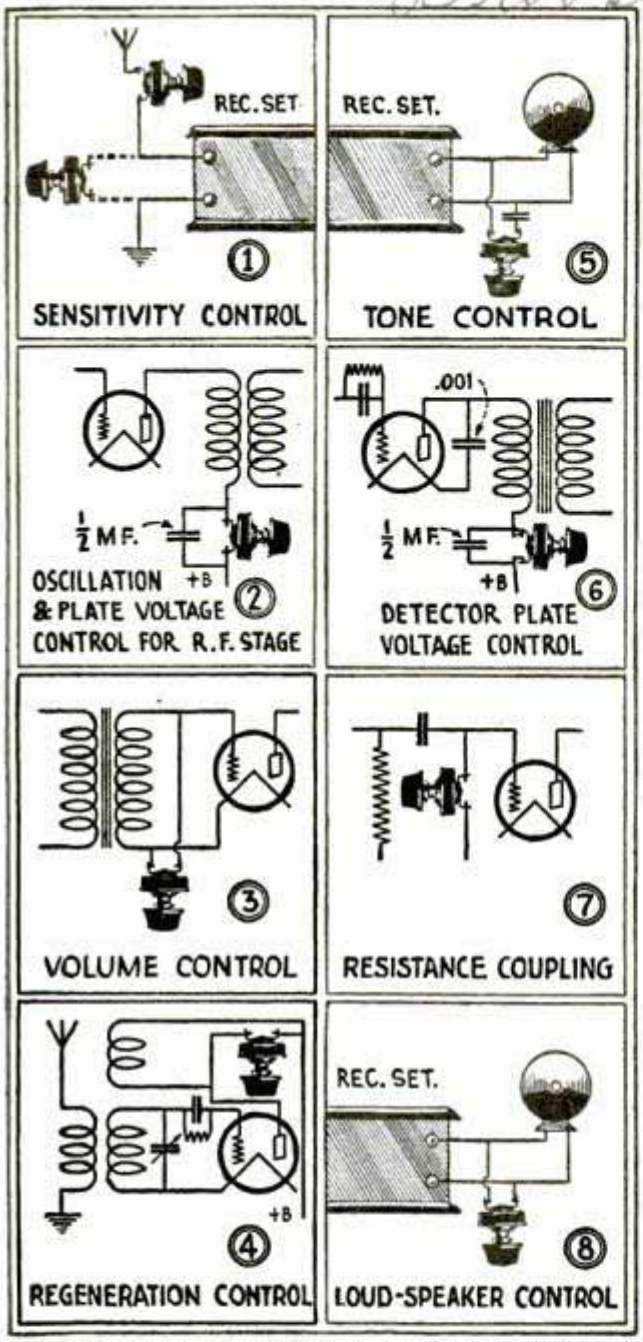
for holding the soldering iron is made of No. 12 gauge wire and screwed to the wooden base, supporting the iron so that the tip rests in the metal cup, the wire bracket being pinched at the bend so that it is a snap fit for the iron. Pieces of solder are dropped in the cup and melted by the iron, and the wire ends to be tinned are then sparingly coated with paste and dipped in the hot solder.—Robert J. Williams, Chicago, Ill.

Dry Rectifier Replacement Units

Dry rectifiers for replacing tungar bulbs and electrolytic units are now available, and the simple method of using them is illustrated in the photos. At the right, the unit is shown clamped to a charger of the tungar type, the bulb being removed and the plug screwed into the socket instead. The unit at the left is designed to replace electrolytic-rectifier jars and takes up no more room than the latter. The unit is made of a number of disks and requires little or no attention after installation.

Left, Dry Unit for Replacing Electrolytic Cells; Right, for Use on Tungar Charger





Simple Methods of Improving the Set by Means of Variable-Resistance Units

Variable Resistance Improves Set

As a means of control, a variable resistance is an important part of any radio set, but many owners do not realize that they can use these in several positions for the improvement of their receivers. The accompanying diagrams give a few suggestions in this respect. The sensitivity control, Fig. 1, prevents excessive signal pick-up, which broadens tuning where sets are located near powerful stations. The variable resistance may be used in series with the antenna or shunted across the aerial and ground binding posts of the set. Try both methods and retain the best. Fig. 2 shows a simple oscillation control by means of which the plate voltage of the r.f. tubes may be regulated to operate the tubes at their maximum efficiency. Increase the plate voltage on these tubes from 90 to 135 volts and insert the variable resistance, shunted by a .5-mfd. condenser, in the 135-volt B-positive lead. In Fig. 3 we have a simple volume-control resistance, shunted across the secondary of the first a.f. transformer, which serves to iron out resonance peaks or causes of distortion in the usual transformer. Regeneration control is possible with a variable resistance shunted across the tickler or feedback coil of a three-circuit tuner, as in Fig. 4, and Fig. 5 indicates a method of tone control for bringing out the low notes and removing harshness from the speaker output. In this case, the variable resistance is placed in series with a .25-mfd. fixed condenser and shunted across the loud-speaker terminals. Many of the special detector tubes now in use require a micrometric plate-voltage control for best results; this is obtained by the method shown in Fig. 6. Resistance and impedance-coupled a.f. amplifiers are improved by a variable grid resistance in place of the usual fixed gridleak employed in such stages, and the position of the resistance in the circuit is given in Fig. 7. This method is particularly good in the power-tube stage, but is useful in all resistance-coupled stages. As a loud-speaker control, to regulate volume, the variable-resistance unit is shunted across the speaker terminals, as shown in Fig. 8. This procedure is not to be confused with the tone-control method previously described. If two loud speakers are used, one of high and the other of low pitch, each may be shunted with a volume control and the relative output of both controlled for the most desirable blending.

The Latest in Super-Power Tubes

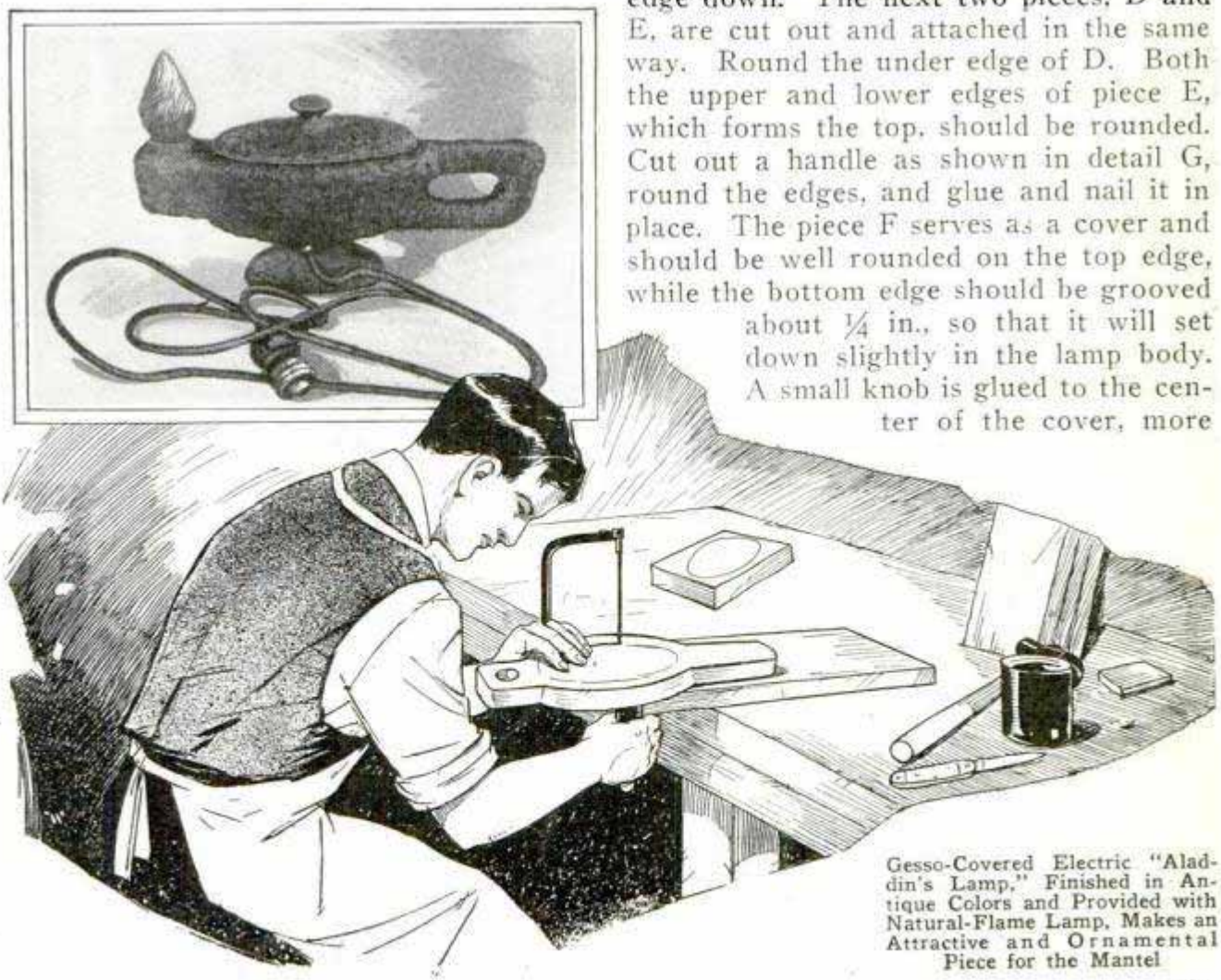
A new super-power tube, to be known as the UX-250 or CX-350, has been announced. This tube is a larger and more powerful amplifier than the UX-210 type. It provides a far greater loud-speaker volume, without distortion, than has heretofore been possible. It may be used at a fraction of its full capacity, thus making possible undistorted output at all times.

An Electric "Aladdin's Lamp"

By DICK HUTCHINSON

ONE of the most interesting novelties that the home craftsman can make in his leisure moments is an electric "Aladdin's lamp." By consulting the illustrations and following the instructions, anyone can make this simple and attractive lamp, and equip it for electricity at the cost of a few cents.

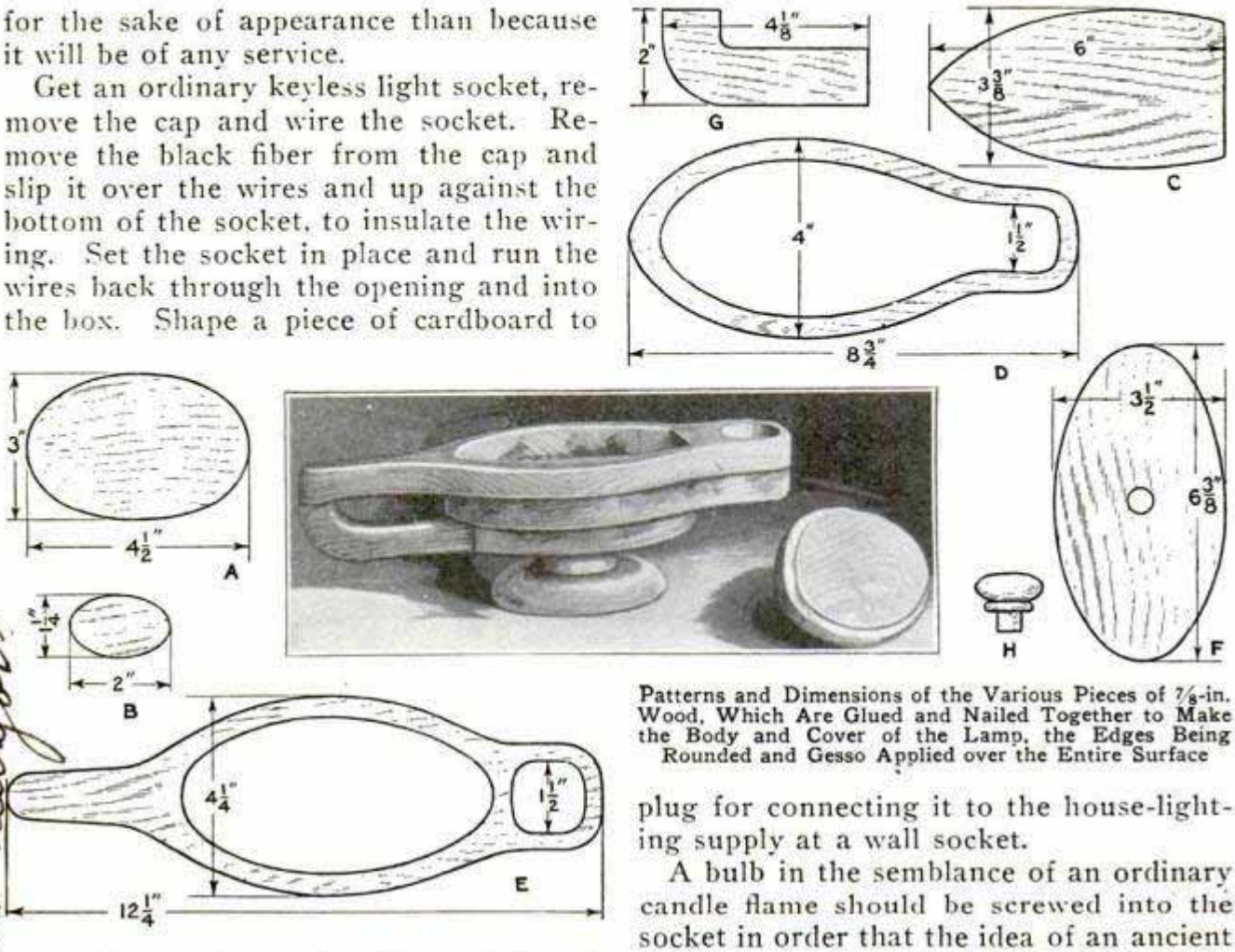
It is made of white pine, a number of pieces being cut out of ⅞-in. material, according to the design and dimensions given in the patterns. All the pieces can be cut out with a coping saw, although a band saw may be used if available. First cut out an oval, 3 in. wide and 4½ in. long, as shown in detail A. This forms the base of the lamp. Round off the upper edge with a jackknife or wood file. Glue and nail the small oval B to the first piece, exactly in the center. Now cut piece C, which is also rounded on one edge, then glued and nailed to B, with the rounded edge down. The next two pieces, D and E, are cut out and attached in the same way. Round the under edge of D. Both the upper and lower edges of piece E, which forms the top, should be rounded. Cut out a handle as shown in detail G, round the edges, and glue and nail it in place. The piece F serves as a cover and should be well rounded on the top edge, while the bottom edge should be grooved about ¼ in., so that it will set down slightly in the lamp body. A small knob is glued to the center of the cover, more



Gesso-Covered Electric "Aladdin's Lamp," Finished in Antique Colors and Provided with Natural-Flame Lamp, Makes an Attractive and Ornamental Piece for the Mantel

for the sake of appearance than because it will be of any service.

Get an ordinary keyless light socket, remove the cap and wire the socket. Remove the black fiber from the cap and slip it over the wires and up against the bottom of the socket, to insulate the wiring. Set the socket in place and run the wires back through the opening and into the box. Shape a piece of cardboard to cover the opening under the socket, and glue and tack this in place. Drill a 7/16-in. hole up through the side of the body of the lamp and insert a fiber bushing of the kind used in fixtures.



Patterns and Dimensions of the Various Pieces of 7/8-in. Wood, Which Are Glued and Nailed Together to Make the Body and Cover of the Lamp, the Edges Being Rounded and Gesso Applied over the Entire Surface

The lamp is now ready for a coating of gesso. Pour about ½ pt. of liquid glue into a receptacle and into this stir enough ordinary whiting to make a thick putty. Add 3 or 4 spoonfuls of linseed oil, and then stir in more of the whiting to make a good workable putty. With an ordinary pocketknife, pack sufficient putty around the socket to hold it firmly in place. Then cover the entire lamp with the putty, with a more or less rotary movement, to produce a rough effect. When completed, let it set for a day or so to dry, then go over with bronze and, after this has dried thoroughly, paint with antique red ground in japan. Rub up the high lights with a soft piece of cloth. Then with a piece of cloth dipped in antique green, ground in japan, rub over the entire surface lightly, or just sufficiently to give it the appearance of old bronze. Pull the light cord out through the fiber bushing and attach a plug for connecting it to the house-lighting supply at a wall socket.

A bulb in the semblance of an ordinary candle flame should be screwed into the socket in order that the idea of an ancient oil lamp may be carried out as realistically as possible.

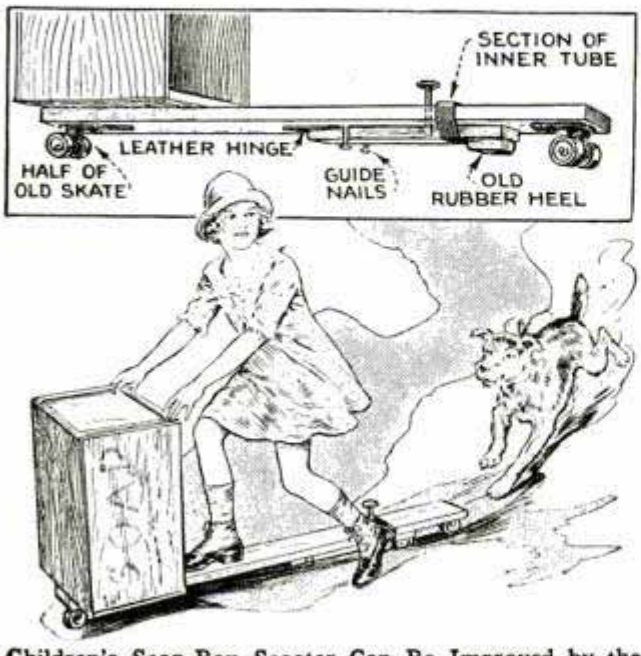
Cleaning Hot-Water Reservoir of Silt and Dirt

Where we live in the west, the water supply comes from the mountains and carries adobe to a marked degree, especially during the spring of the year and after a rain, which occurs almost every afternoon at our altitude of 8,000 ft. We use considerable water, and the reservoir of the kitchen range has to be filled four or five times a day. After every emptying there is about 2 in. of dirty water that has to be removed. The range is used all day and sometimes also during the night, so that the reservoir is always hot. Taking out the dirty water was therefore a painful task, until one day when the car was being washed, it occurred to me that a big sponge would be useful to soak up the boiling water in the dirty reservoir. I got a pie-tin lifter and proceeded to drop the sponge into the boiling, silty water, removed it and submerged it in a

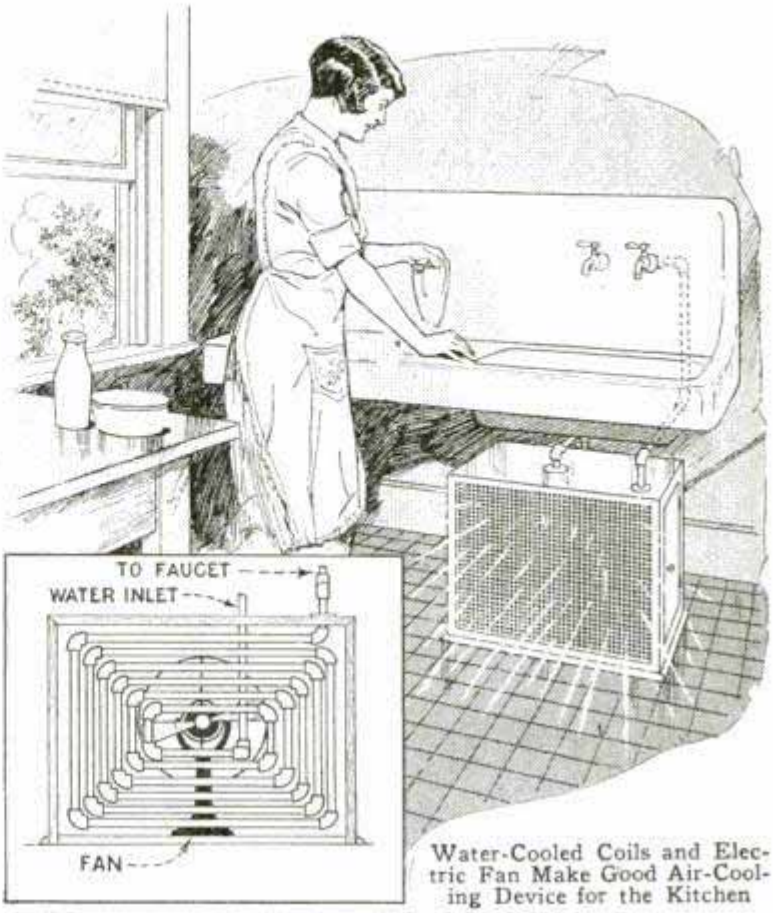
pail of cold water. Then I squeezed all the water out of the sponge and repeated the operation a few times until the reservoir was empty.—Winifred McMillen, Ridgway, Colo.

Foot Brake for the Scooter

Nowadays, homemade soap-box scooters have found particular favor among the kiddies, but their use has certain disadvantages. They help wear out shoe leather remarkably fast, as the feet are used both for braking and propulsion. To avoid some of this unnecessary wear, the brake shown in the drawing may be provided. It consists of a strip of wood, fastened to the underside of the scooter by means of a leather hinge. An old rubber heel is nailed to the other end of the brake, a section of inner tube is provided to keep the brake off the ground, an old valve stem is used as a pedal to press the brake down, and two guide nails are driven on each side of the brake to hold it in position. In use, the child presses on the pedal, which causes the brake to bear down against the sidewalk. This stops the scooter in a short distance, depending on the speed and the pressure on the brake.—Earl E. Moffat, Los Angeles, Calif.



Children's Soap-Box Scooter Can Be Improved by the Addition of a Brake



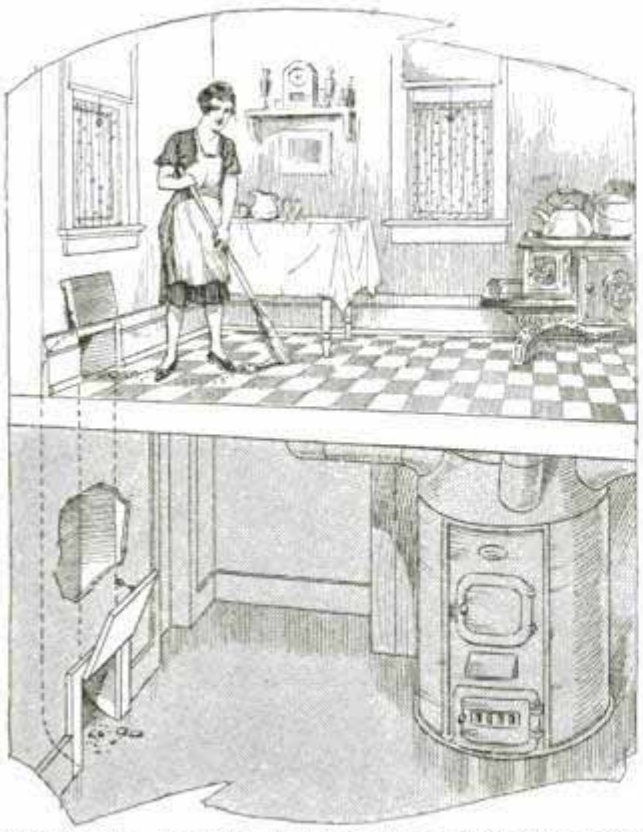
Water-Cooled Coils and Electric Fan Make Good Air-Cooling Device for the Kitchen

Device for Cooling Kitchen Air

During summer, the kitchen is usually a warm place and, although a ventilating fan will remove hot vapors, it does not cool the air. This, however, can be accomplished by means of a set of cooling coils placed in front of an electric fan, as shown in the drawing. The coils are made of water pipe and fittings, and the device is cut into the cold-water main so that the water flows through the coils before it gets to the faucet. This practically insures a supply of fresh, cool water in the coils. The fan circulates air between the coils and in the room, moderating the heat considerably. It is, of course, advisable to inclose both the coils and the fan in a box with two screened sides.—Kenneth Coggeshall, Webster Groves, Mo.

Improving the Bread Knife

Few bread knives cut fresh bread well and with regularity. This trouble can be overcome quickly in the following manner: Place the knife near an open stove-burner flame, not on the fire but close to it so that the blade will get warm. Then try it on the fresh bread.



Dirt Chute Installed in the Kitchen Dispenses with the Usual Dustpan and Waste-Paper Basket

Dirt Chute for the Kitchen

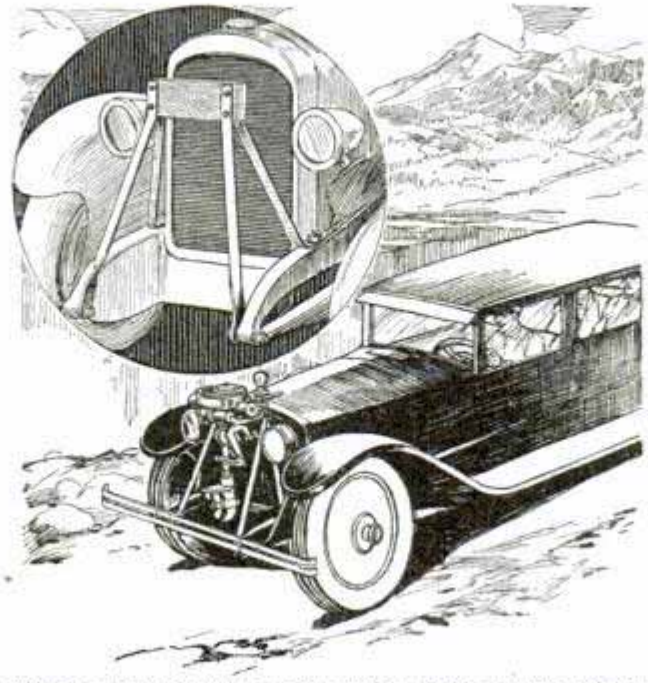
Keeping the kitchen floor clean is greatly facilitated by the installation of a dirt chute as shown in the drawing. It is similar to the common type of clothes chute, except that the opening is made in the baseboard between two studs, so that all the sweepings are readily brushed into it. When the chute is not in use, the opening is covered by a portion of the baseboard, which has been carefully cut out and hinged to swing upward as indicated. A similar opening between the same studs is provided in the basement, the lower edge of the opening being flush with the basement floor so that a shovel can be used to scoop up the dirt when disposing of it in the furnace. It is advisable to make the chute of sheet-metal as this material will not catch or retain dirt and also as a safety measure.—Glenn O. Wilson, Denver, Colo.

Electric Heater for the Thermos Bottle

To avoid the necessity of preheating a lunch-box thermos bottle, the annoyance of heating extra water, and the danger of breaking the glass lining in doing this, I have used an electric curling iron from which the hinged member was removed so that only the rod containing the element remained. By its use coffee can be made at night, the grounds strained out, and the clear liquid allowed to cool overnight. In the morning the coffee is poured into the thermos bottle cold, the iron is inserted into the bottle and the cord plugged into the light socket. The coffee will then be heated without cracking the bottle.—Thayer Beckwith, Tiffin, Ohio.

Bracket Holds Outboard Motor on Auto

Many campers pass up the pleasures of an outboard motor because they have no space to carry it. The drawing shows a convenient method of disposing of the motor without sacrificing any space. A wooden bracket is attached to the front end of the car as indicated. A 1 by 7 by 12-in. oak board is supported on ¼ by 1½-in. iron brackets bolted to the frame of the car. Two ¼ by 1½-in. bars extend from the board to the front spring bolts, to give rigidity to the bracket. The length of these bars varies with each particular make of car, but if the top edge of the board is located about 3 in. below the top of the radiator, the height will usually be suitable. The outboard motor is attached to the bracket as indicated, and it will not obstruct the air circulation to any appreciable extent.



Wooden Bracket Attached to Front End of Auto Holds Outboard Motor Securely

Better Labels for Fruit Jars

Labels pasted on fruit jars often come off, which makes it more or less difficult for one to identify the contents. A better method is to etch or grind a frosted patch on the side of the jar. Thus you can write on the rough surface with a lead pencil, and this writing will only come off by washing. The etching is done by forming a small "dam" of putty around the portion to be frosted, and pouring a little hydrofluoric acid on the glass thus inclosed. Stir the acid with a brush, and in a few minutes the glass will be found to be sufficiently etched. Pour off the acid, remove the putty and give the jar a thorough washing to remove all traces of the acid and putty. Another method is to rub the glass with a small piece of flat marble dipped in glass-cutters' sand moistened with water. If the sand is too coarse, use fine emery powder and water.

Tape for Temporary Signs

Electricians' friction tape can be used to make temporary signs, which are often necessary during the construction of a building. Cut lengths of the tape to form letters, as indicated in the drawing, and apply them to the wall, door or window, wherever a sign is needed. The tape will adhere securely but can readily be pulled off. If some of the adhesive remains after this, remove it with a cloth saturated with gasoline.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

Hat Holder for Sedan

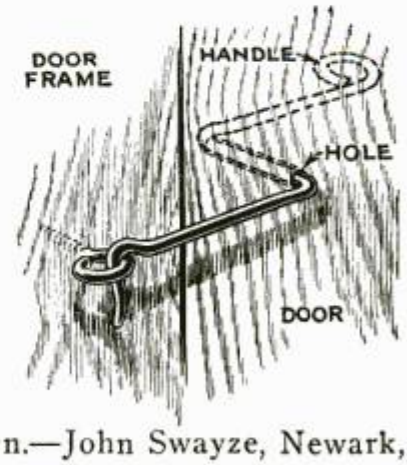
When on an auto tour and wishing to remove one's hat, a satisfactory place to put it, out of danger of being crushed, is hard to find, especially if the sedan is crowded, or considerable luggage is carried along. However, a simple hat holder

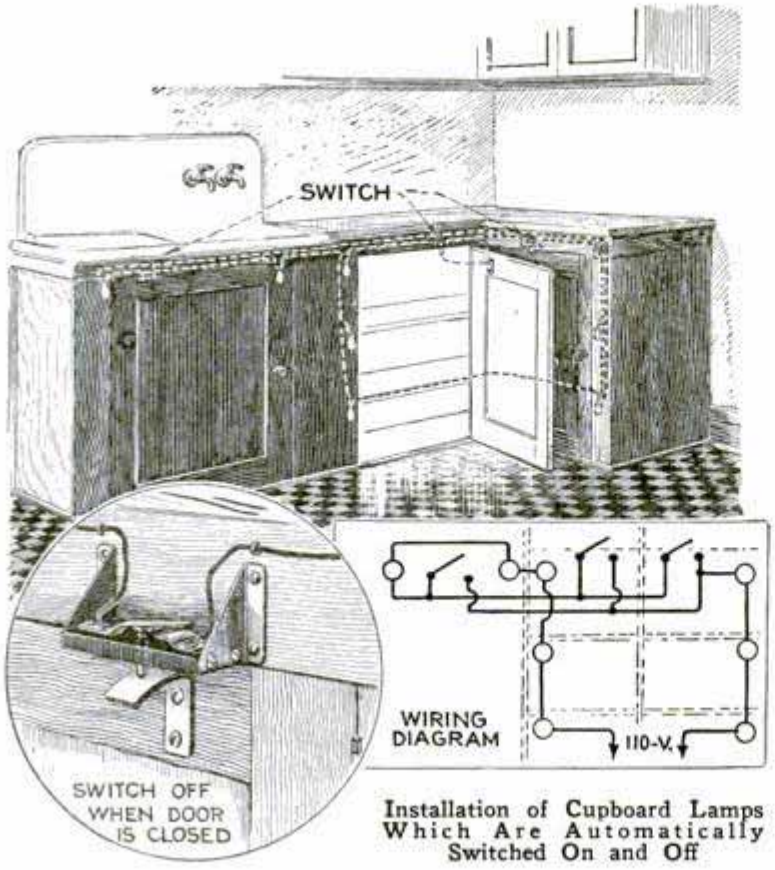
Wire Hat Hanger for the Sedan Is a Real Convenience on a Long Automobile Trip

can be made from a wire clothes hanger. It is bent to the shape shown in the drawing, two eyes being formed so that it can be screwed to the side of the car near the top. It must, of course, be of such size that the crown of almost any hat can be slipped through without being pinched.—Adolph Lonk, Chicago, Ill.

Handle on Screen-Door Hook Permits Opening from Outside

It is often desired to lock or unlock a screen door from the outside and this is, of course, impossible, unless a regular latch or a specially made hook of the type shown in the drawing is used. The hook is made of No. 10 or 12-gauge galvanized-iron wire. A hole to receive this size of wire is first drilled through the door at the proper point and the wire then bent to the shape shown.—John Swayze, Newark, New Jersey.





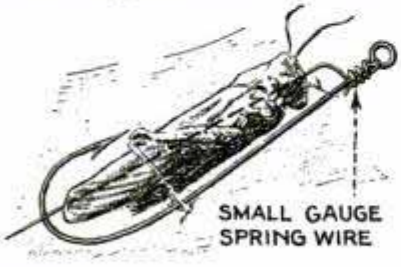
Installation of Cupboard Lamps Which Are Automatically Switched On and Off

Automatic Control for Lamps Installed Inside of Cupboard

The lower cupboards in the pantry usually have solid doors, making them dark inside so that it is difficult to find utensils. To provide light, get an eight-lamp Christmas-tree cord, equipped with white lamps. Such a cord can be plugged into the 110-volt house-lighting circuit. To control these lamps automatically so that they are lighted when the door is opened, arrange a spring switch, as indicated in the detail. A switch of this kind can be fitted to each door.—W. Saul, Lexington, Mass.

Fishhook Improved to Hold Insect Bait

Anglers who prefer to use grasshoppers and other insects as bait for trout and similar game fish, find that it is rather difficult to fasten them to an ordinary hook so that they will appear lifelike and will not come off easily. One fisherman improved his hook by adding a length of small-gauge spring wire to it as shown. The wire is inserted through the eye of the hook and wrapped on the shank, leaving a single prong or tine projecting downward and bearing against the lower part of the hook. The end of the tine is ground to a point. To bait the hook, the tine is raised and the insect is slipped on. When the tine is released, it resumes its position against the hook and prevents the bait from coming off.—G. E. Hendrickson, Argyle, Wis.



Adjustable Measuring Cup

The novel cup shown in the illustration facilitates the measuring of fixed quantities of material. For instance, in sowing seed beds, a certain quantity of seed is usually weighed out for each bed. Instead of weighing the desired quantity for each bed, the seed is weighed out once, and the measuring cup is then adjusted to hold just this amount. Thereafter the container is filled brimful each time. The cup consists of two parts, one telescoping inside of the other. The inner one is shallow, and has no handle. The outside cup is slotted to permit its diameter to be made smaller by tightening a thumbscrew, which is threaded through two lips soldered beside the slot as indicated. A handle is, of course, also provided. The inner cup can be slid up or down when the thumbnut is loosened, to enable the user to obtain various measures.—D. S. Olson, Missoula, Mont.

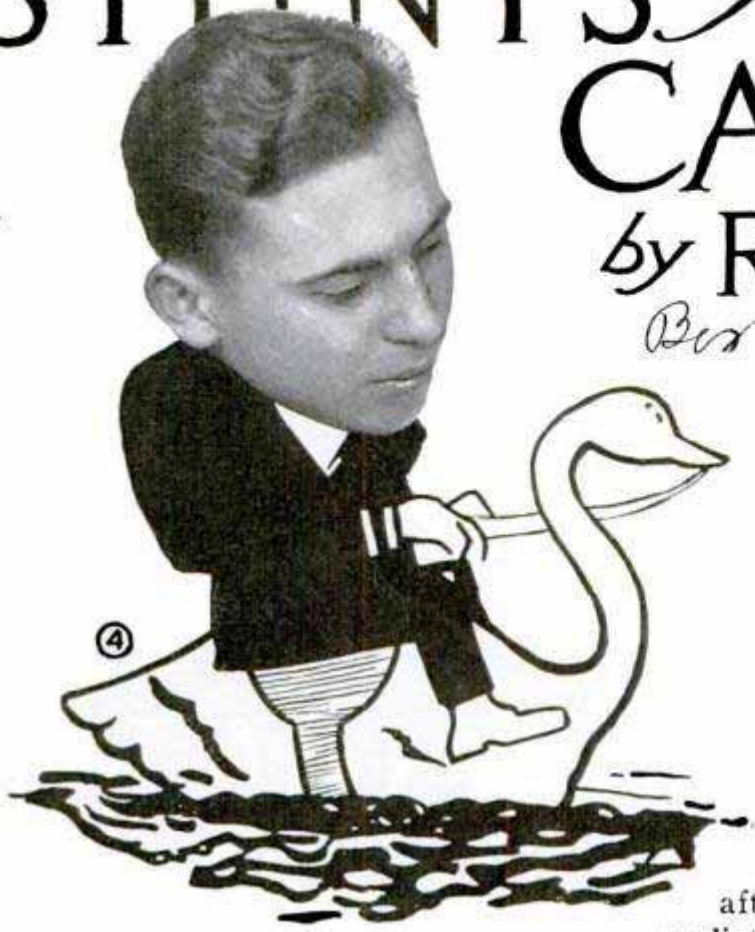
Gray Finish for Polished Brass

Unlacquered brass articles can be given a beautiful gray finish without the use of paint in the following manner: Mix 1 oz. of tartar emetic with just enough muriatic acid to dissolve it. Add water equal to one-third of the mixture. Apply the solution to the brass and the color will soon change to a pleasing gray.

STUNTS *for the* CAMERA

by Robert Gregg

Box 327, 318 W. 57th St.
New York City.

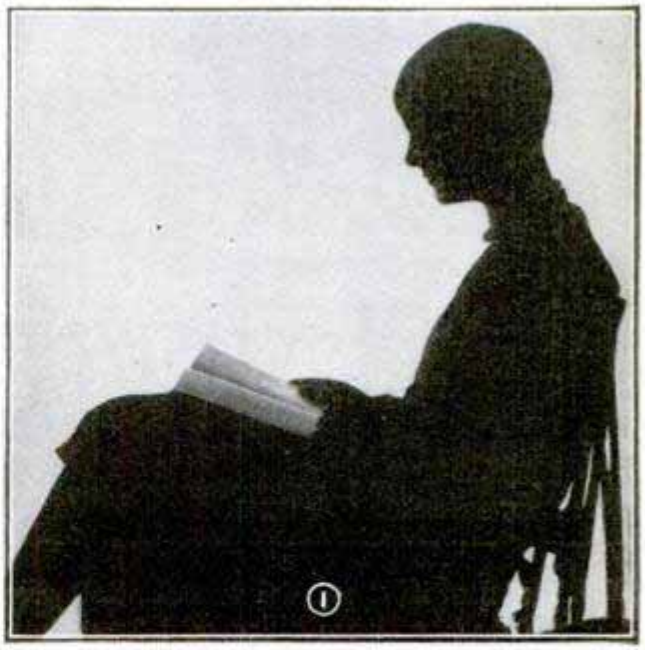


TO many amateur photographers, and that includes practically everyone at some time or other, the camera represents a mere snapshot-taking device, while the more puzzling phases of camera craft, the trick photograph and the silhouette, are almost unknown arts. The popular impression that trick photography demands the skill and knowledge of the professional is entirely erroneous, for excellent results can be obtained at the first trial, even with the most inexpensive camera.

Take the silhouette. Here we have a two-tone product in black and white which affords a pleasant relief from the monotonous gray of the ordinary print. Two rooms, with an open doorway between, are needed in making these pictures. The doorway should be entirely covered with a white bedsheet, stretched smooth so that no wrinkles can be seen.

The person to be silhouetted takes his pose two feet in front of the sheet, and in such a position that the face will be in full profile and not even the lashes of the eyes can be seen when the subject is viewed from the location of the camera. A flash gun is set in place five feet behind the sheet, as shown in Fig. 1. With the flash, sheet, subject, and camera all placed in their respective positions, you are all set to make the shot.

Just before the exposure is made, all lights in both rooms must be extinguished and the blinds drawn, if any outside light penetrates. When the room is in total darkness, the shutter of the camera is opened and the flashlight ignited, after which the shutter should be immediately closed and the light in the rooms turned on again. That's all there is to it.



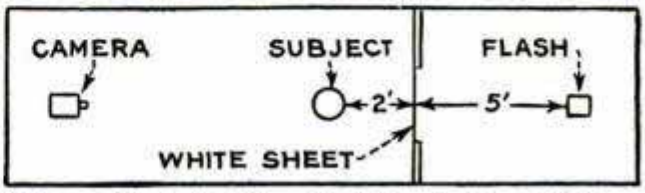


Diagram Illustrating How the Silhouette Portrait Shown Above Was Made with Simple Apparatus

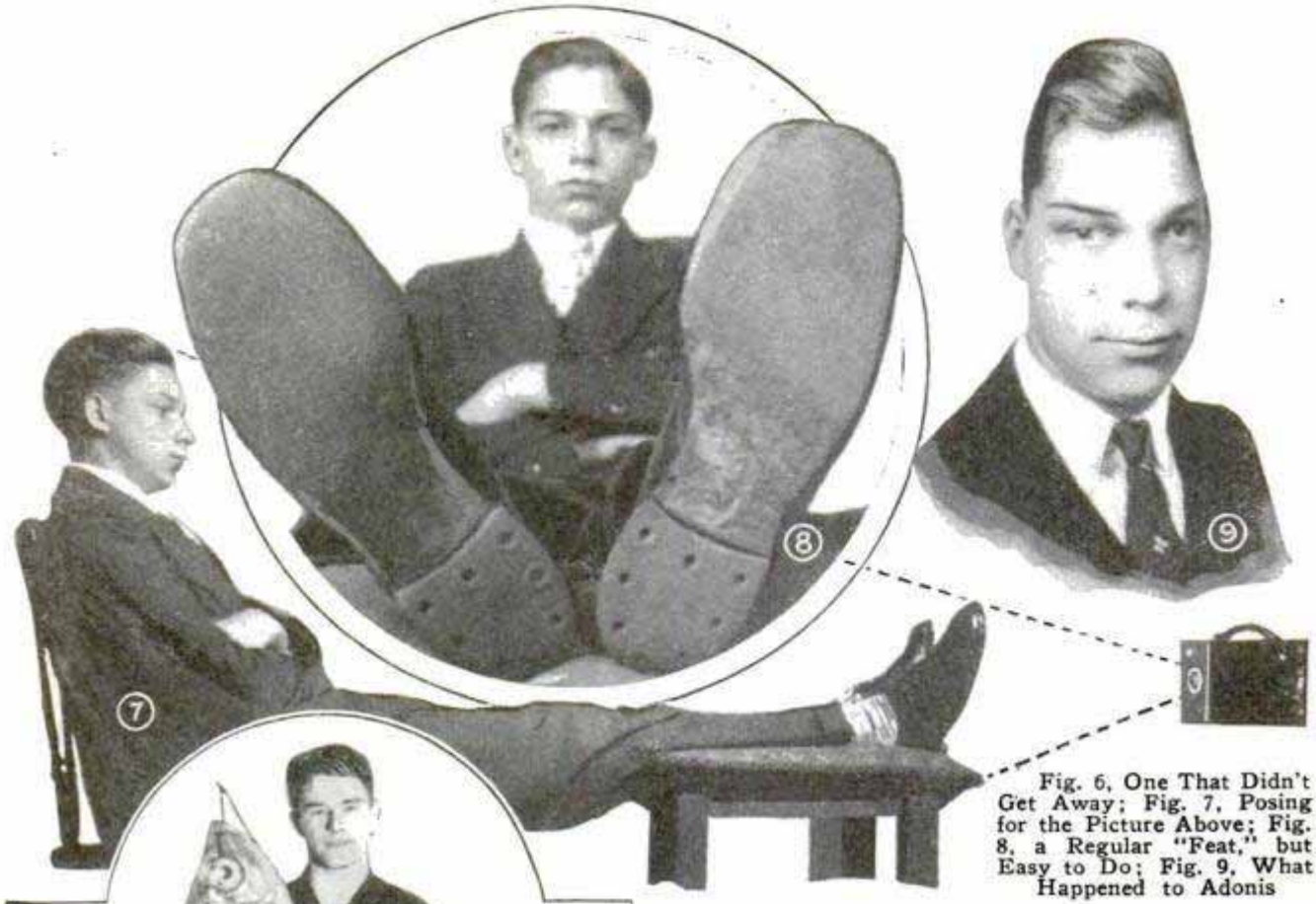


Fig. 6, One That Didn't Get Away; Fig. 7, Posing for the Picture Above; Fig. 8, a Regular "Feat," but Easy to Do; Fig. 9, What Happened to Adonis

Development in the usual manner will give you effects like those pictured herewith.

Silhouettes can also be made in daylight if posed before a window which admits an abundance of clear, unobstructed light. Fig. 2 is an example. In making this picture, white paper was tacked on one side of an old screen door, and this was placed outside and a few feet from the open window, with the top of the door leaning back so that it reflected the light of the sky. All other light, except that coming through the window, was shut off. A vest-pocket kodak, with the lens stopped down to f. 11, was used, the exposure time being about ½ minute.

So much for the silhouette. Another form of camera craft especially suited to the amateur is the "cartoonette." This is a combination of a cartooned pen-and-ink sketch, Fig. 3, called a "comic foreground," with an actual head, the result being as shown at the head of this article. Comic foregrounds can be purchased quite cheaply from any large photographic-supply house, or you can make your own by enlarging Fig. 4 to five times the size indicated. Do this on a white sheet of cardboard, about 18 by 30 in., making the squares on the cardboard about 2½ in. on the side. Sketch in the figure lightly with pencil, and then outline and black in with a good grade of India ink, as in Fig. 3.

The manner of using the foreground is illustrated in Fig. 4. The sheet of cardboard containing the cartoon is held on the subject's knees, and arranged by the photographer so that his head rests just above the neck of the cartooned body. A

white background is placed behind and the picture taken.

Did you ever go fishing? And catch nothing but little dinky sunfish? Yes? Well, you can still save the day if you have brought along the li'l old camera. Here's the how of it: You simply attach the aforesaid "little dinky sunfish" to the end of your line, pose in the manner shown in Fig. 5, and let your brother fisherman take the picture. Due to the simple principle of angles, the resultant picture will be something like the one shown in Fig. 6—a perfect example of fisherman's luck!

Another wide-angle study is pictured in Figs. 7 and 8. Fig. 7 shows how the camera was arranged in relation to the body in taking the picture, and Fig. 8 how the finished picture turned out. No use arguing—it's some "feat"!

Remember the last time you went to the carnival? And saw your perfectly proportioned anatomy and physiognomy distorted by the convex and concave mirrors? Funny, wasn't it? The clever amateur photographer can produce the same ludicrous effects, and what's more—they're permanent! The method is simple. You take a photograph of any prize beauty and crease it lightly down the center. That's all. A snapshot of this photo, when developed, will assume the grotesque proportions shown in Fig. 9. Other effects can be produced by creasing the photograph across or by bending it diagonally, as shown in Figs. 10 and 11 respectively.

Perhaps one of the oldest of camera tricks is "The Man in the Bottle." In the illustration, Fig. 13, it is "The Girl in the Bottle," but in any case the method is identical, and good results can be obtained out of doors with any ordinary vest-pocket camera.

Have the subject stand on a box which has been covered with a black cloth, and take a snap of him, or her, from a dis-

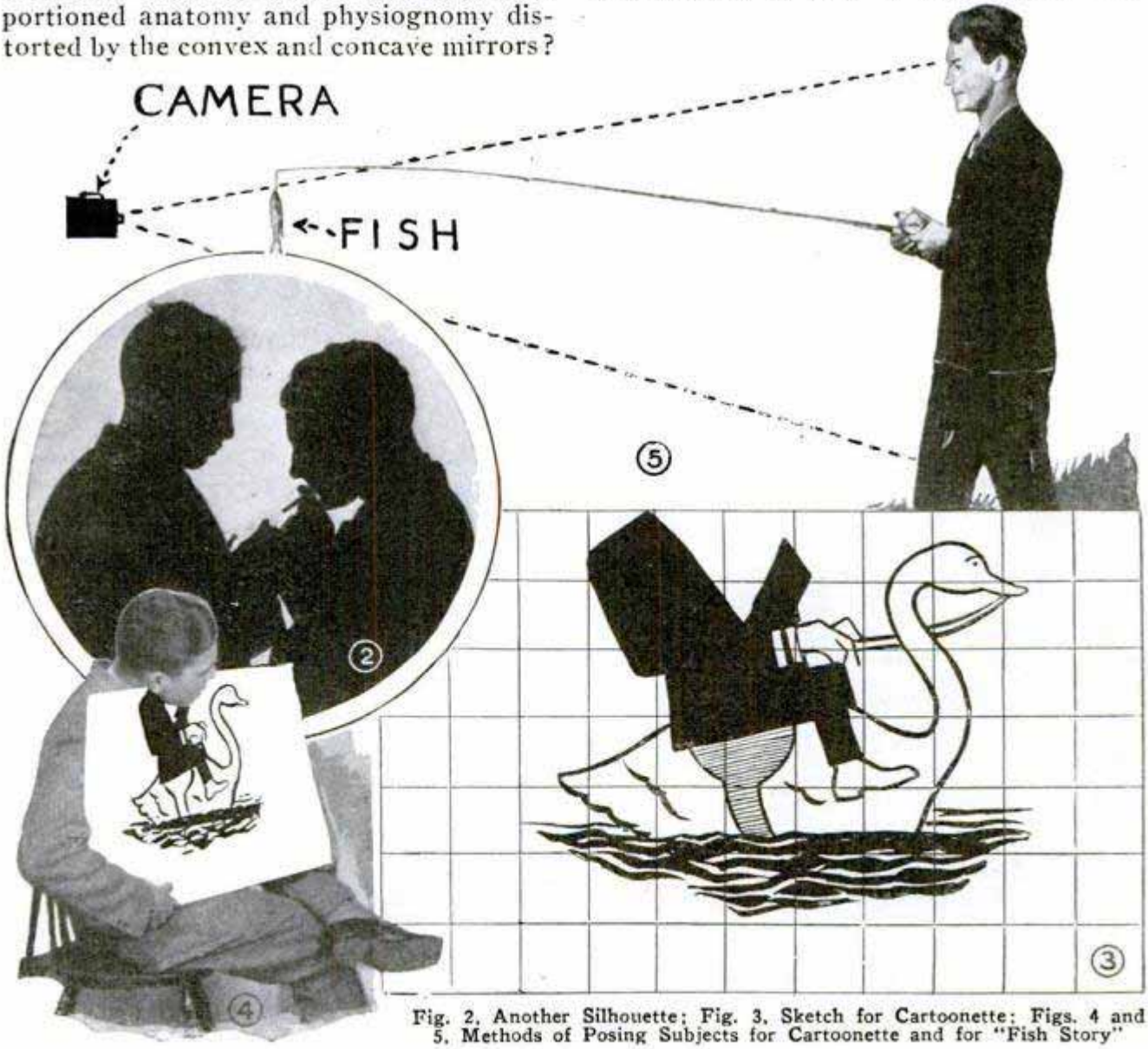


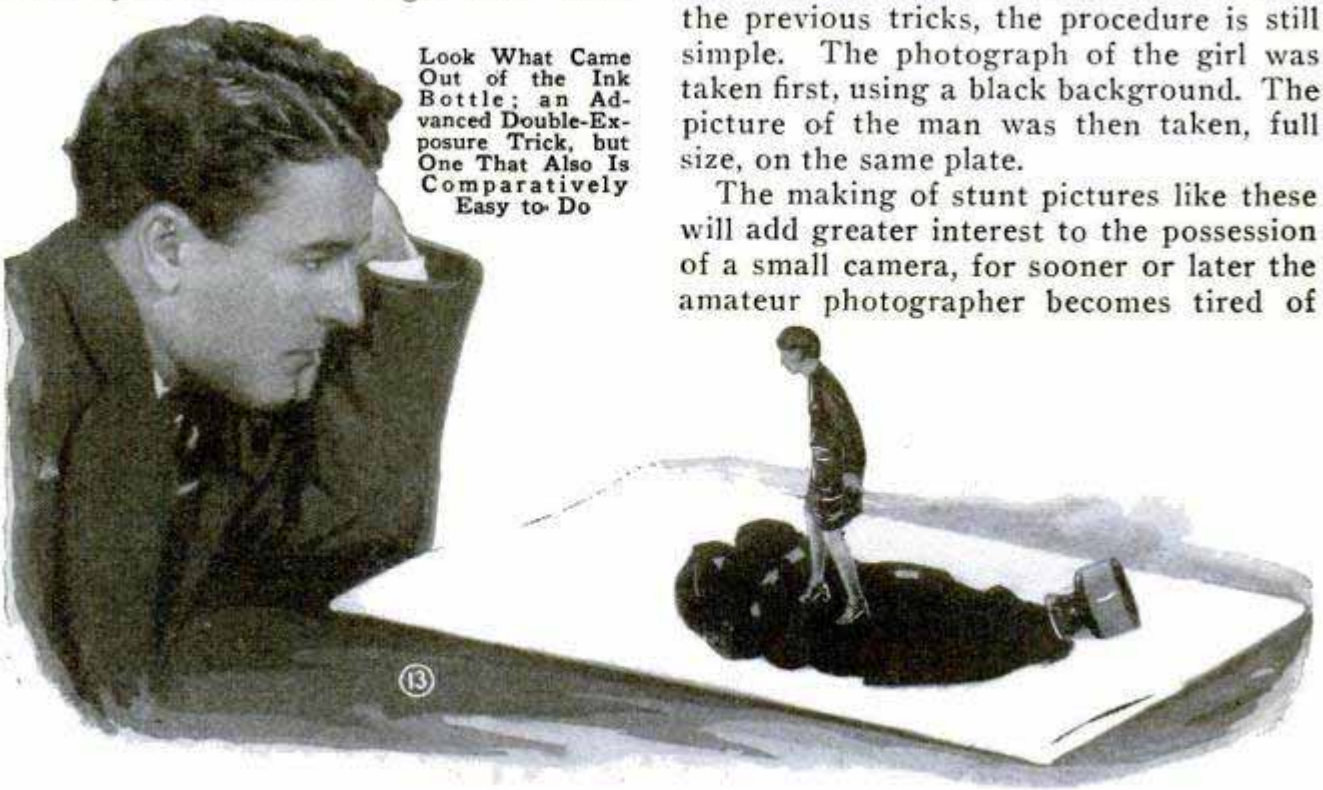
Fig. 2, Another Silhouette; Fig. 3, Sketch for Cartoonette; Figs. 4 and 5, Methods of Posing Subjects for Cartoonette and for "Fish Story"

Figs. 10 and 11, Further Examples of Simple Distortion; Fig. 12, "The Girl in the Bottle," or "Canned Peach," If You Prefer to Call Her That

tance of 15 ft., resting your camera on some solid object. Then obtain a large clear bottle and place it in such a position that the outline of the bottle will be sure to extend all around the subject's picture. Snap the bottle on the same film. Make this exposure a trifle longer than when taking the picture of the subject. With a little experimenting you will be able to produce this quaint effect as easily as taking an ordinary snapshot.

The example shown in Fig. 13 is an advanced double-exposure stunt but, while this demands somewhat more skill than the previous tricks, the procedure is still simple. The photograph of the girl was taken first, using a black background. The picture of the man was then taken, full size, on the same plate.

The making of stunt pictures like these will add greater interest to the possession of a small camera, for sooner or later the amateur photographer becomes tired of



Look What Came Out of the Ink Bottle; an Advanced Double-Exposure Trick, but One That Also Is Comparatively Easy to Do

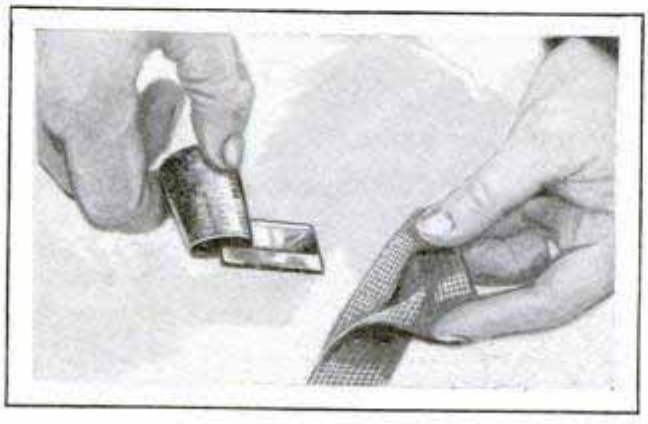
the eternal sameness of his snapshots, and looks for other worlds to conquer. Stunt pictures afford a new world of pleasure, not only for himself, but for his friends also, and mean the reanimation of interest in a worth-while hobby.

Rain Cap for the Gasoline Hose

Most gasoline pumps provide a holder for the hose, which keeps the open end of the nozzle upward. The objectionable feature of this position is that heavy rains fill the hose with water, with the result that some customer gets a liberal portion in his gasoline. To prevent this, one gas-station owner made a special cap for the hose nozzle to keep out the rains. It was made of brass, with a slight taper to match that of the nozzle. The small end was closed by soldering on a disk of the same metal. A small chain was fastened to the open end and to the nozzle base. When the cap was removed, it hung from the nozzle by the chain. After use of the hose, the cap was placed over the nozzle and the latter hooked on the hose rack of the pump. No water from rains has entered the hose since the cap was provided

Cork Holds Razor Blade for Ripping

An old safety-razor blade is a handy tool for ripping seams and other similar jobs. However, the thin blades are rather hard to hold with the fingers. To provide a suitable handle sink one end of the blade into a cork as shown in the photo. This makes it much easier to manipulate the blade.—Frank W. Bentley, Jr., Missouri Valley, Ia.



Ordinary Cork Used for Handle of Safety-Razor Blade When Ripping Seams

Rowboat Operated by Bicycle Mechanism

Finding rowing too hard, slow and generally inconvenient, one rowboat owner installed a bicycle mechanism to propel it.

Bicycle Mechanism Fitted to Rowboat and Driving a Propeller Provides More Speed and Less Hardship

Two cranks were provided instead of one, so that both hands and feet could be used, which was found to be less tiresome than using either alone. The chain drive is connected to a small propeller.

Paraffin Used for Waterproofing Canvas

For waterproofing canvas, paint it with a solution of paraffin and gasoline. The solution is prepared by dissolving as much paraffin, cut into small, thin shavings, as the gasoline will absorb. When applied to the canvas, the gasoline carries the paraffin into the pores of the cloth, after which it evaporates, leaving a sediment of paraffin that waterproofs the cloth effectively. The solution can be applied by means of an old whiskbroom. If it is let stand for any length of time, more gasoline will have to be added to replace that lost by evaporation, and the solution must be stirred thoroughly.

Washer Laid over Tack to Be Pulled Provides Leverage and Prevents Objectionable Marks

Easy Method of Removing Tacks

The screwdriver is an ever-ready tool for the average house owner to dig out tacks. Its efficiency at this job can be improved considerably by using a small washer as shown in the illustration. The washer is put over the tack and provides a good fulcrum, holds the screwdriver in place, and makes it possible to pull out a stubborn tack without marring or nicking the wood.

Rubber Cap on Broom Handle Protects Varnished Surfaces

Rubber caps of the kind used on the ends of crutches can be obtained in various sizes at almost any drug store. It is a good idea to provide the broom and mop handles with these caps in order to avoid marring papered walls and varnished woodwork, for, when one is busy working, it often happens that the end of the handle hits a piece of furniture or the broom is inadvertently placed against the wall.—W. W. Snypp, Lakewood, Ohio.

Oiling the Doormat

After some use, coco and other fiber doormats collect dust, which is naturally tracked into the house. This nuisance can be entirely avoided by spraying the mat with cedar oil, using a fine garden or fly-poison sprayer. Apply just enough oil to barely cover the surface of the mat. If this is done properly, you need have no fear of the oil being tracked into the house. By giving the mat an occasional shake, all dirt and dust can be removed, and it will always be clean.—L. B. Robbins, Harwich, Mass.

Collapsible Tent Pole

In order to economize on space when touring, a collapsible tent pole of the kind shown in the drawing will be found of considerable utility. If the pole length is 6 ft., only one joint is necessary, and a length of hardwood, 1 in. square, will be satisfactory. The pole is cut in two equal pieces which are hinged together by means of ordinary flat-iron angles adapted to this purpose as indicated. Four of these angles are required. They are attached securely by means of wood screws so that the ends project and are in alinement. A machine screw can then be inserted to serve as a pivot. A short chain and a cotter pin are attached by means of a staple or screweye, the pin being used to hold the hinges together when the pole is set up at full length.—Claude P. Fordyce, Falls City, Nebraska.

Method of Preserving Paint and Enamel

Everyone who has used paint and enamel knows that, if the can is not emptied but the rest put away for the future, the paint in time becomes hard and useless. A good method of preventing this trouble is to melt some paraffin and pour it over the paint as soon as one has finished using it. This hardens over the surface of the

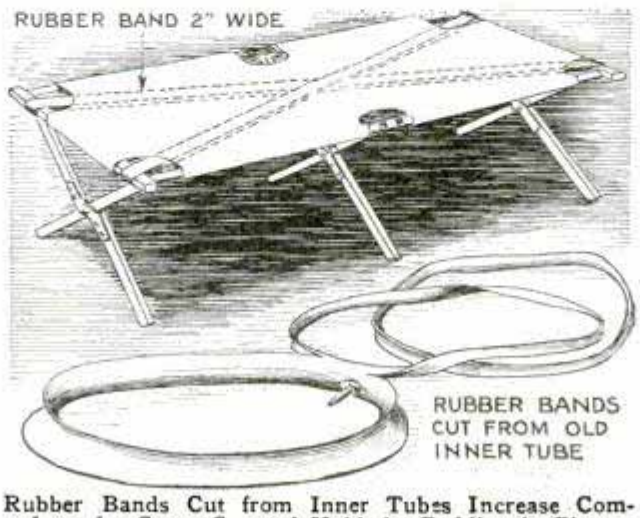
paint but provides an effective seal against the air, thus keeping the paint in good condition indefinitely.—Charles Latour, Jr., Plattsburg, N. Y.

How to Make an Ornamental Box with Button Design

A useful box ornamented with pearl buttons can be made from a wooden cigar box, a mint container of the 1-lb. size or a coffee tin. Cover the outside surface with a sizing coat of glue, and after this is dry, apply gesso or Egyptian clay to the top and sides to a thickness of about ⅛ in. While the clay is still soft press a row of flat pearl buttons of uniform size into it around the edge of the lid. If desired, you may make a simple design of buttons, such as a four-leaf clover, in the center of the lid. With a stiff brush stipple or swirl the clay in the spaces between the trimming, both on top and on the sides. After the clay has set, apply gold bronze to the stippled spaces with gold paint and give the button border and central figure any colors desired with paint. Green or red buttons make a very lively trimming against the gold-bronze background. Also paint the inside of the box with gold-bronze paint.—Hilda Ellyson Allen, Onawa, Iowa.

Camper's Cot Made Comfortable with Rubber Bands

Two long rubber bands, about 2 in. wide, cut from an old inner tube and stretched diagonally underneath the canvas of a folding cot, as indicated in the illustration, will add greatly to its comfort. Smaller bands, about ¾ in. wide, run crosswise under the cot and over the bedding at the ankles and the waist, will prevent an uneasy sleeper from throwing off his covering. When the cot is folded, these bands can be used to hold the cot in a compact bundle.

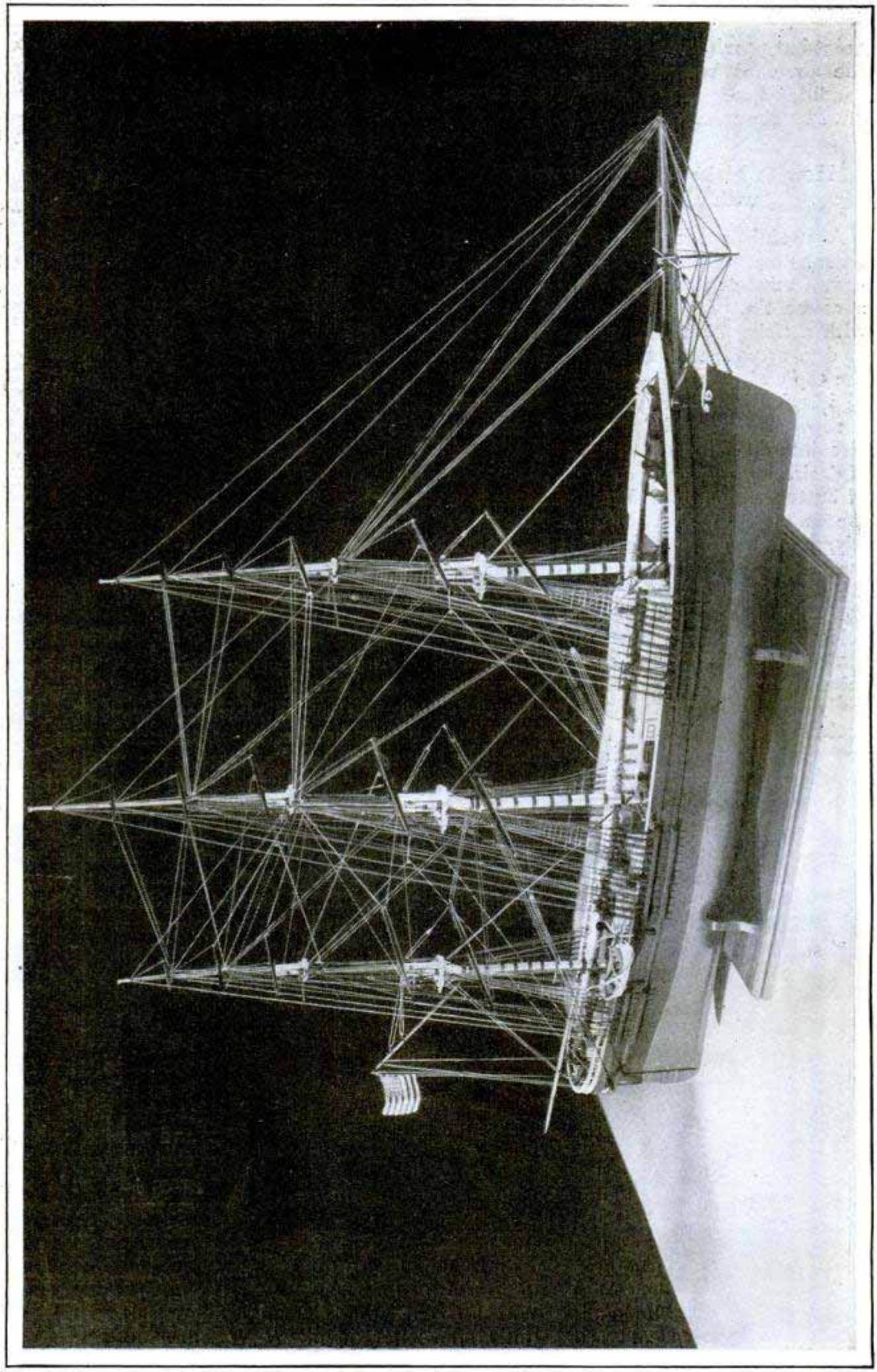


Rubber Bands Cut from Inner Tubes Increase Comfort of a Camp Cot and Hold the Bedding in Place

Detachable Handles for the Outboard Motor Are Convenient for Carrying It

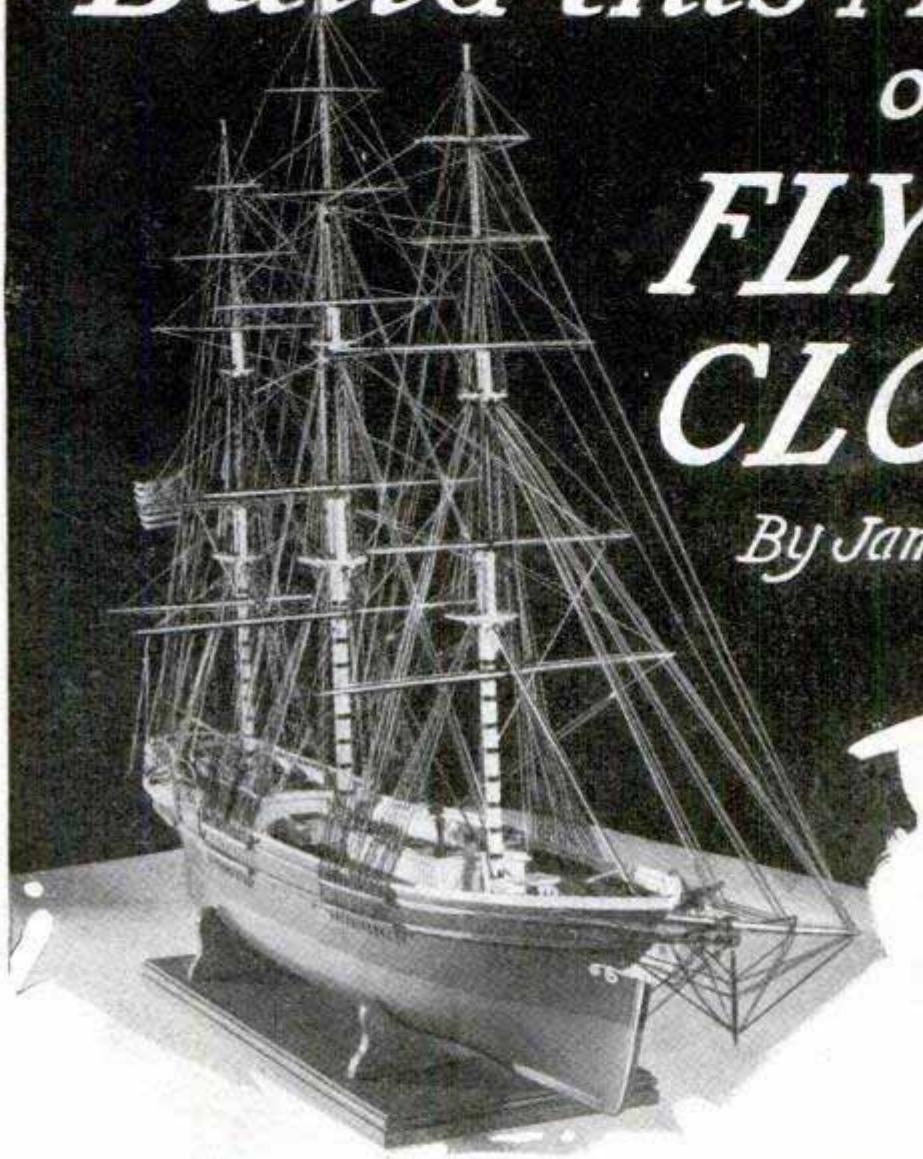
Detachable Handles for Outboard Motor

An outboard motor is an unusually bulky article and difficult to carry, because there is almost no way of getting a firm hold of it. One cannot grasp the steering handle, timer lever or other projecting parts, for fear of damaging them. Hence, specially made handles, fitting the spark-plug holes of the cylinders, will be found convenient. Each handle is made of cold-rolled steel rod, bent to the shape most suitable for the purpose, and the end is fastened to the body of an old spark plug, by threading the handle end and using nuts to hold the parts together or by welding. Such a pair of handles occupy very little space in the tool box. When the motor has to be lifted and carried or handled in any other way, all that is necessary is to remove the spark plugs and screw in the handles in the spark-plug holes.—John Edwin Hoag, Los Angeles, Calif.



Build this Model of FLYING CLOUD

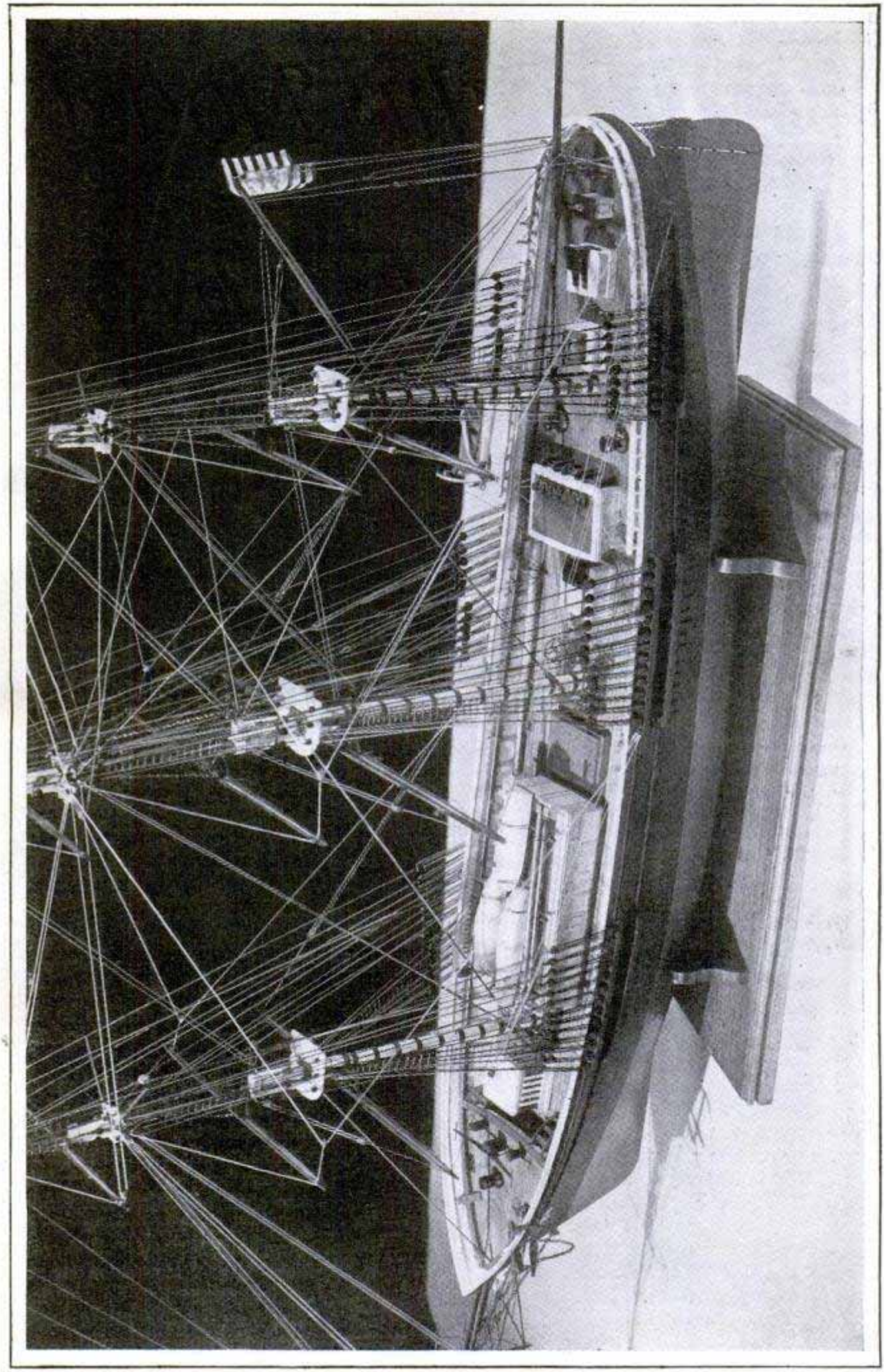
By James Tate



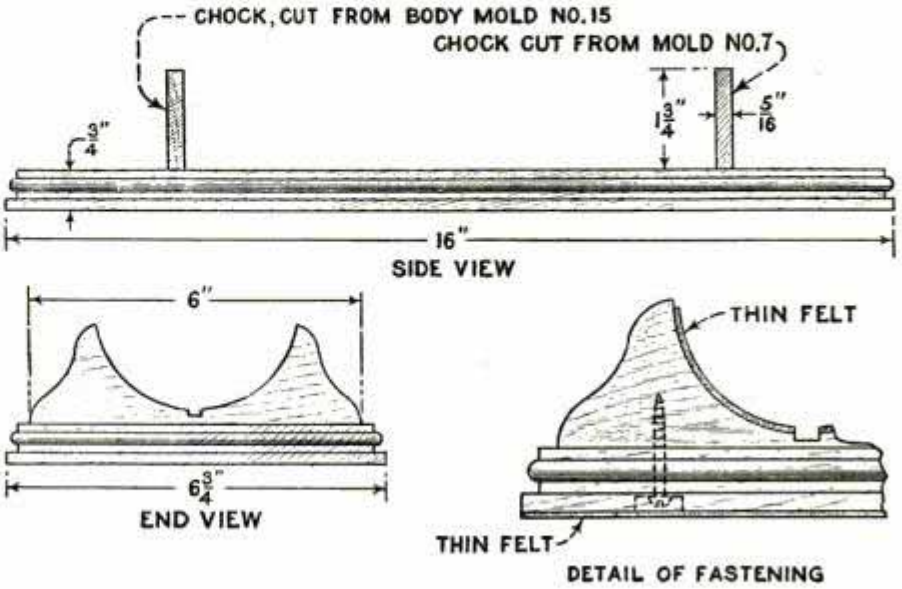
ONE more item, small but essential, should be added to the model to make it complete: the guys for the main-brace bumpkins. From a point ⅛ in. inside the end of the bumpkin on each side, fit a short length of 22-link chain, running down to the center of the lower molding. Fit a similar chain from the end of the bumpkin, on the after side, to a point ¾ in. straight aft on the hull. Paint black. These guys help the bumpkins take the strain on the main braces.

Make the stand for the model of mahogany or walnut, the base being ¾ in. thick, 16 in. long and 6¾ in. wide. Cut the chocks that support the model from 5/16 by 1¾ by 6-in. stuff, marking them off from body molds Nos. 7 and 15. Run a simple molding around the edge of the base and mark the holes for the chock screws at the proper points; then drill, counterbore and screw the chocks in place. When shaping the insides of the chocks to fit the hull, allow about 1/16 in. on each side for the thickness of the thin-felt lining. Stain the wood light-brown mahogany or light walnut and finish with several coats of wax, rubbing to a hard, dull polish.

It is not essential that the pattern given for the stand be followed exactly, but it is advised that the lines of the stand be kept simple. An overelaborate stand, highly varnished or polished, merely calls undue attention to itself and detracts from the appearance of the model rather than adding to it. The simpler the stand is, the better the ensemble will look.



Whether or not a case should be built for the model is largely a matter of taste. There is no doubt that, in the home, an "open" model is decidedly more attractive than one inclosed in a glass case, but, on the other hand, ship models are marvelous dust catchers and hard to clean, and there is always the risk of the enthusiastic maid or housewife doing a lot of damage when dusting around a valuable model. If a case is made, the same advice applies as for the stand; make it simple and avoid heavy, overelaborate moldings.



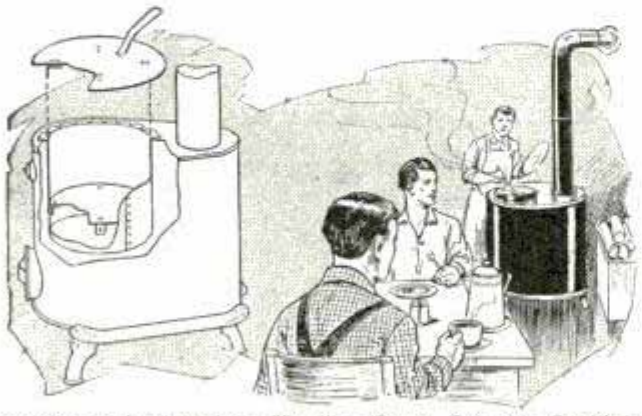
The two full-page photos accompanying this article illustrate how the photos for the contest should be taken. Here, again, it is not essential that contestants' photos be exactly like these, but the two views show best the points on which models will be judged, and thus are best from the point of view of the contestant, as well as of the judges.

One hint in connection with the taking of these photos will be useful. Use a black background, and illuminate the model from the same side as that on which the camera is placed. In the photo on page 1030, the camera was pointing at the starboard bow, and the light was coming over the starboard quarter. The black background shows up the running rigging, and the reflected light on the standing rigging makes the black cords stand out also. The pictures lose somewhat in printing, but, on the original photographs taken by this method, every line was as sharp and distinct as though etched on the plate.

According to the rules, the contest closes two months after the date upon which the final article appears in the magazine. Consequently the deadline is Aug. 1, 1928, and all photos and negatives must be in our hands on or before that date.

Cooking on a "Tin Heater"

Here is a method Manitoba cordwood cutters use for cooking on a light sheet-metal stove, called a "tin heater." A heavy tin or sheet-metal container, such as an ice-cream can, is hung in the stove through a hole in the top, as shown, the upper edge of the can being cut in sections, which are bent over at right angles to form a shoulder. A sheet-metal disk is cut to fit on the container, four small brackets being provided to hold it in place. If a ready-made container is not available for this purpose, one can be made from a piece of sheet metal of suitable size. It is bent to a cylindrical form, the edges being overlapped about 1 in. and fastened with copper rivets. The bottom is a disk held in place by right-angle brackets fastened to it and to the side of the container. A hole should be made in the cover to facilitate its removal. Baking can be done in the container, frying and cooking on top. There will be no trouble from smoke or soot.—H. Webster, Winnipeg, Can.



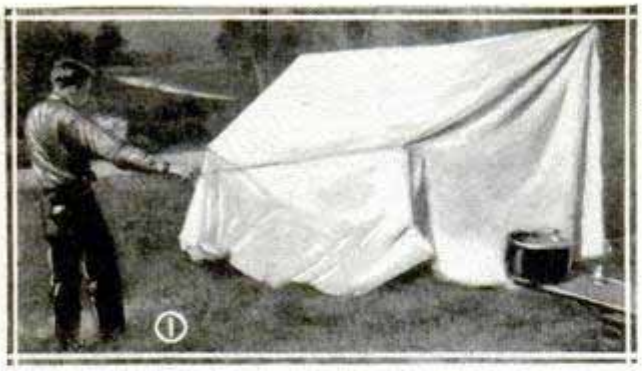
Container Installed in Heating Stove Permits Cooking without Smoke and Soot

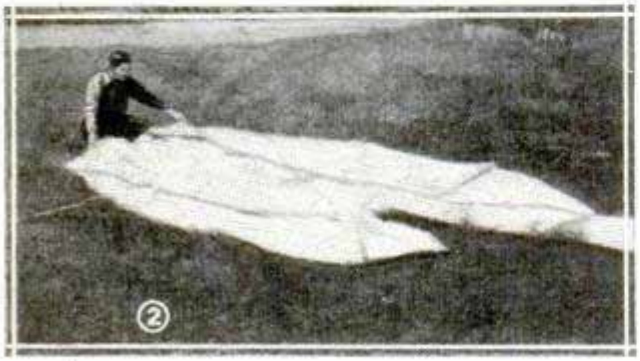
How to Fold a Tent Single-Handed

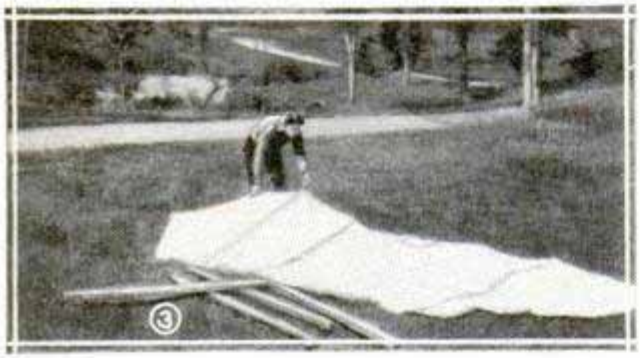
By R. R. CARRYL

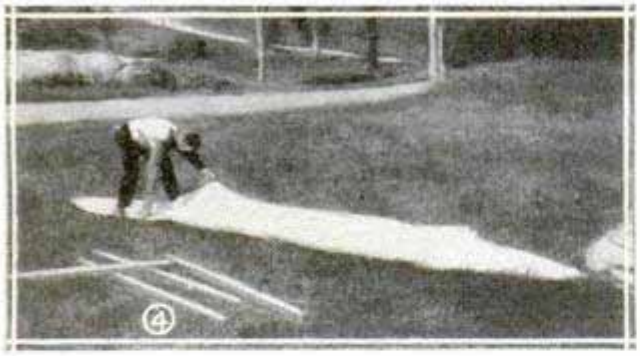
WHEN out camping, there is usually more than one person to help in breaking camp, taking down the tent and packing up the provisions and accessories. Sometimes, however, it is necessary to fold the tent single-handed; this is often considered quite a difficult job, but anyone can do it without trouble by carefully following the instructions contained in this article and proceeding along the lines indicated in the accompanying photographs. Although this method may require a little longer time to do the work than it would with the help of an assistant, the job can nevertheless be done just as well.

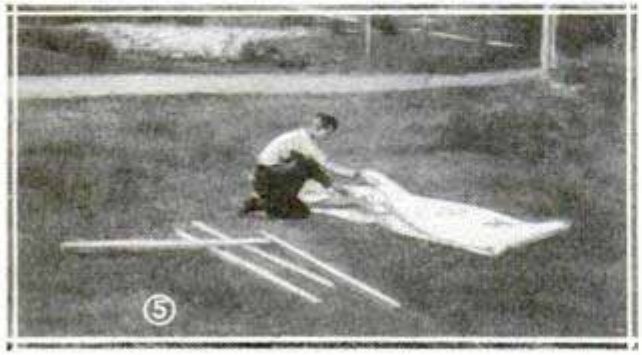
The first step in taking the tent down is to loosen all the guy ropes except the corner ones, Fig. 1. The butts of all the ridgepoles are then moved over toward one side, for instance, the right side as you are facing the opening of the tent, and the two corner ropes on the left side are then loosened. As the poles are set at an angle their weight will prevent the tent from falling over until the corner ropes on the right side are loosened, and the

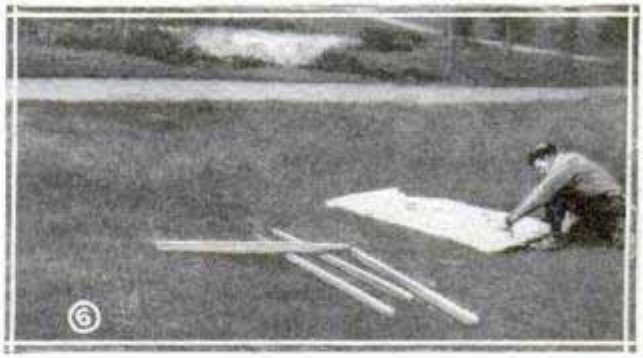


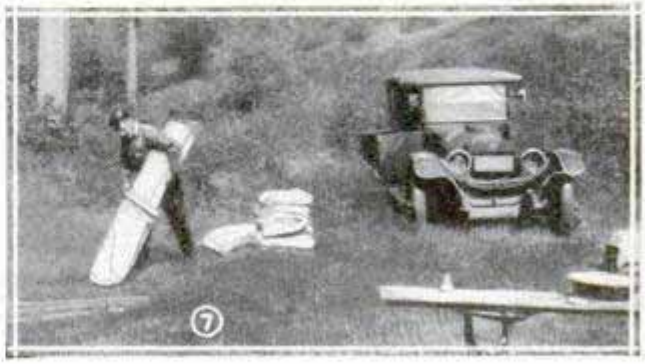












Striking Camp and Folding and Packing the Tent Are Usually Formidable Jobs for One Man, but by Using the Method Shown in the Above "Movie," the Task Is Made Comparatively Simple: the Photos Show All the Steps in Taking Down and Folding the Tent, in Proper Sequence

tent allowed to tip and fall over to the left. One side of the tent is then carried over so that the inner side of the tent is entirely exposed and the outside and all the guy ropes underneath. The poles are removed and packed separately. The tent sides, which include all the material up to the edge of the roof where the guy ropes are attached, are folded over toward the inside, care being taken to straighten out the ends and the flaps of the opening, Figs. 2 and 3. Keep all the guy ropes outside. Fold the tent over again, as shown in Fig. 4, so that the width is a little less than the length of the carrying bag. If you have no carrying bag, the width should correspond to the space allowed for storing the tent. All the ropes now project from one side. Bring both ends over toward the center, as shown in Fig. 5, and after folding all the ropes in, start rolling the tent to form a tight bundle, Fig. 6. Stop just as the roll is finished so that its own weight will hold it in place while you get the carrying bag. Then, holding the rolled tent under one arm, proceed to slip on the cover, as shown in Fig. 7. After this is done, draw a rope through the brass eyes to close the bag tightly. If the bag is placed where rain can get at it, be sure to set it in such a position that the opening is underneath, in order to prevent the rain from penetrating to the inside.

To waterproof the bag or the tent, dissolve paraffin in gasoline and apply to the canvas. The paraffin fills the pores and effectively waterproofs the fabric.

Fastening Screen-Door Hook Securely

Most screen-door hooks can readily be opened by merely striking the door, the jar causing the hook to jump up out of the screweye. To prevent this from occurring, as is often desired, especially when the doors are left open all night during the summer months, it is only necessary to turn the screweye over a little, forcing it over the end of the hook. When this has been done, the hook cannot be opened until the screweye is turned back to its original position.

Rake Made from Discarded Magnets Is Useful for Picking Up Nails and Tacks

Magnetic Rake Picks Up Nails

I had numerous tire punctures caused by nails picked up in the alley, outside my garage, and decided to eliminate this trouble by the use of a magnetic rake. This was made from discarded Ford magneto magnets, which anyone can obtain from a junk yard for a few cents, and the photo clearly shows its construction. In a few minutes, I picked up over two quarts of spikes, nails and tacks from a small space. —C. H. Rise, Rapid City, S. Dak.

Aluminum Paint for Auto Rims

Auto rims become rusty after having been in use for some time. Graphite paint is often applied to the rim to prevent the accumulation of rust, but this does not always prove effective. It is better to scrape as much of the rust off as possible, clean the rim thoroughly and then apply a coating of aluminum paint. This covers well and adheres to the metal for a considerable length of time.—Thomas Blaine, Evanston, Ill.

Two Hooks Attached to a Stove Provide a Handy Place for the Teakettle

Hanger on Stove Keeps Teakettle Out of the Way

On a small gas range it often happens that the teakettle is in the way when cooking, and it is rather difficult to find another place to put it. Two hooks, made of heavy galvanized-iron wire and bent as shown, are attached to the side of the stove. Hung on these, the kettle is out of the way entirely, yet readily accessible. —C. D. Paterson, Worcester, Mass.

Effective Ant Exterminator

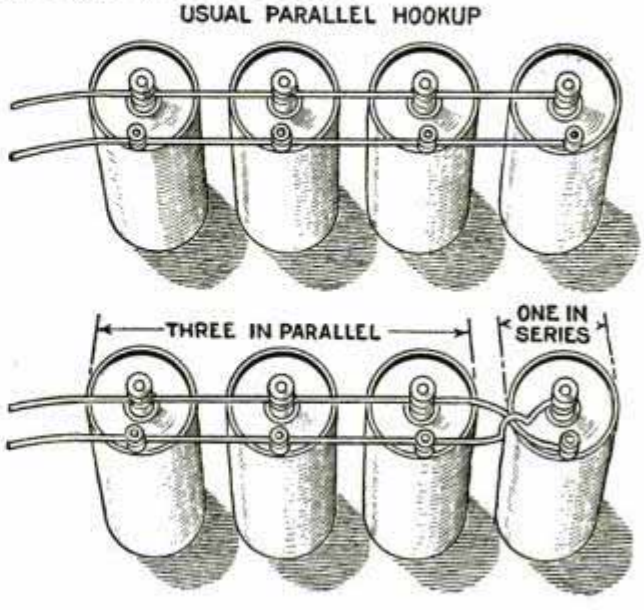
The best ant exterminator I have ever used consists of the following ingredients: arsenate of soda, ¼ oz.; white sugar, 1 cupful; cream of tartar, ¼ teaspoonful; hot water, 1 pt. Mix and stir these ingredients until the sugar and soda are completely dissolved. Then take three baking-powder cans with tight-fitting lids, and punch several small holes below the covers so that the ants can get in. Put some of the poison in each can and mark the cans conspicuously to indicate that they contain poison. Set the cans near the path of the ants, and in three days they will have disappeared.—William B. Stone, San Jose, Calif.

Beaded Hook Attracts Fish

There are innumerable kinds of trolling hooks, spoons and spinners on the market, but one that should prove just as good as any of these, can be made in a few moments from an ordinary hook. Heat the eye of the hook and open it up. String as many glass beads, of various colors, as possible on the shank. Use a bead with a small hole for the first one so that it will bind at the sharp bend of the hook, and not go to the barb. Heat the eye again and bend it back to its former shape. It can be hardened by plunging it in cold water. The colored beads will prove an attractive lure for bass, and other fish.

Increasing the Voltage of Run-Down Dry Cells

When three or four dry cells, hooked up in parallel, have run down so that their combined output is less than 1½ volts, their power can be increased temporarily by reversing the connections of one end cell, as shown in the lower detail of the illustration. This is done by connecting the center post or positive terminal of the end cell to the side or negative terminal of the next cell, which is connected in parallel with the rest of the cells. Then the negative terminal of the end cell is connected to the positive terminal of the next cell. This arrangement adds to the voltage of all the cells without increasing their amperage, permitting them to be used for a longer period of time.



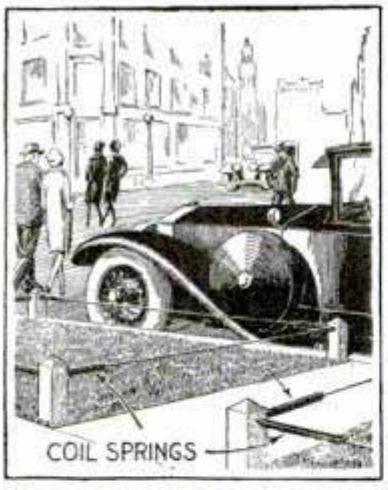
Reversing Connections on End Cell Increases the Voltage of Entire Bank

Hints for the Painter

When using white or red lead, or any paint in paste form, the worker often has trouble in keeping the contents moist, as the lids on such cans are not generally air-tight. A satisfactory method of keeping the material from hardening is to spread a piece of ordinary wax paper over it, pressing it down smoothly over the entire exposed surface. I have found that a wire strainer of the kind used in the kitchen is useful for straining paint. It will hook across the top of almost any can, leaving the worker's hands free to attend to the pouring.—Eric B. Roberts, Regina, Sask., Can.

Protecting Lawns

Ordinarily the public is kept from walking on a lawn or freshly seeded places by the simple method of driving a few stakes around the space and running wires between them. Such barriers, although effective, soon lose their rigidity and then detract from the neat appearance. This is because there is no "give" to the wires and at the first contact the stakes are pulled loose and the wires sag, speedily rendering the barrier ineffective and more or less dangerous. A noticeable departure from the conventional method is shown in the illustration, coil springs being arranged at each corner post. The springs keep the wire stretched taut and there is sufficient give to prevent the wire from pulling the posts loose under ordinary conditions.



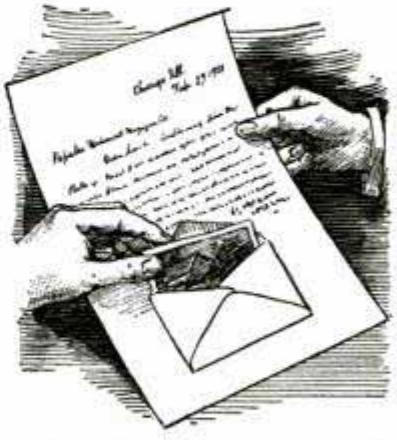
Cheap Balcony a Substitute for Porch

When building a small home, where the appropriation does not allow for an upstairs porch, an airing balcony of the kind shown in the drawing will be found an ideal substitute. It is narrow and can be built after the house is completed, if desired. A railing of some kind should, of course, be provided for safety. For the airing of bedding and mattresses, shaking rugs and brushing clothes, such a balcony will be of considerable utility. Poles, held by suitable wooden brackets, fastened to the side of the house, may be provided for hanging rugs.

This Airing Balcony Is a Good Substitute for a Porch and Costs Much Less to Build

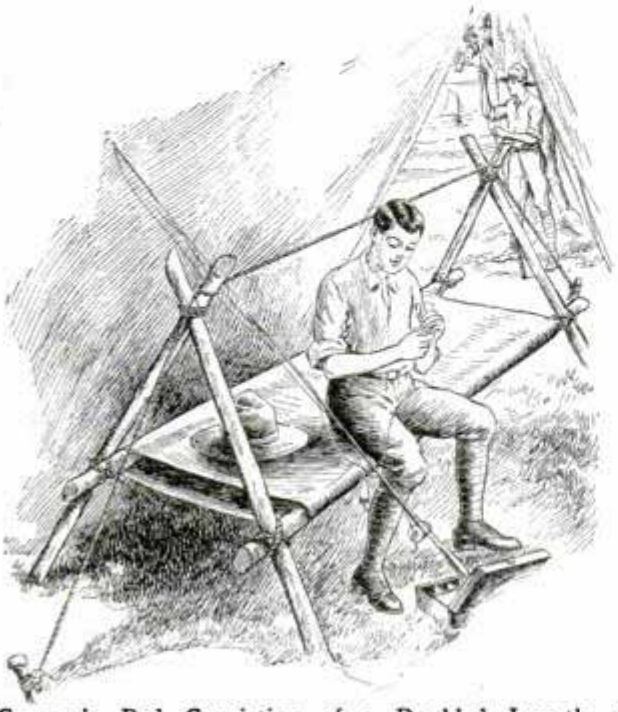
Photo Holder on Manuscript

I have found it very handy, when mailing a photo with a short manuscript or letter, to attach an envelope to the manuscript as shown in the accompanying illustration. Simply apply a little glue or library paste to the four corners on the face of the envelope and attach it to the sheet. This forms a convenient pocket for the photo, preventing it from being lost and protecting it from damage while en route.—Thomas Blaine, Evanston, Ill.



Improving Camper's Bed

The camper's stretcher bed is usually made of a piece of canvas with a hem in each side to fit the supporting poles. A good bed of this type consists of a doubled piece of canvas about 7 ft. long. This enables the user to insert the poles without any trouble and permits the use of poles that would perhaps be too large or too rough to be inserted in the hem. When set up, the top and bottom surfaces of the canvas inclose a layer of air, which acts as insulation to keep the sleeper's back warm. Leaves, grass or extra clothing may be inserted in the open ends of the canvas to make a dead-air space.—J. F. Hayes, Chicago, Ill.



Camper's Bed Consisting of a Doubled Length of Canvas, Which Provides Dead-Air Space

Remedy for Squeaky Auto Brakes

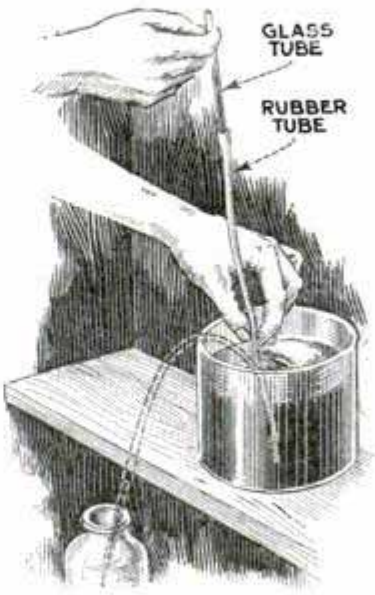
Auto brake linings often become glazed, which causes them to squeak and operate unsatisfactorily. This fault can be easily overcome by treating the brakes in the following manner: Apply kerosene to the brake lining by means of an oilcan. After this, fill the can with neat's-foot oil, and apply in a similar way. Such attention, once a month, will keep the brakes in a dependable condition and silent. Of course, brakes treated in this manner will not be fit for use immediately afterward, especially if the kerosene and oil have been applied quite liberally. The surfaces of both drum and lining are then covered with oil, reducing the friction and allowing the brake to slip.

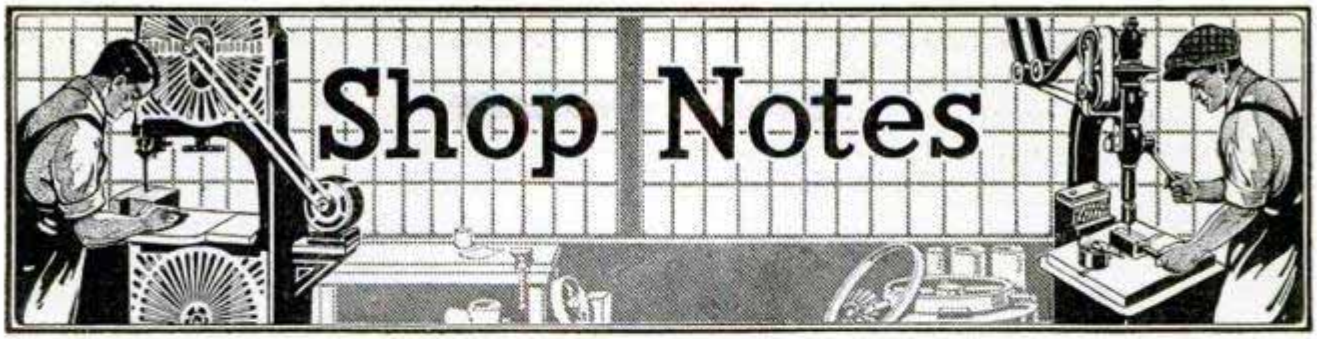
How to Waterproof Matches

On camping trips I often had considerable trouble in keeping matches dry, until I waterproofed them in the following way: I obtained a small plug-tobacco tin, the kind that has a wide cover and is large enough to hold a layer of matches. After these were put in, they were covered with melted paraffin. Another row of matches was laid down in the soft paraffin, and more paraffin was added, the process being repeated until the box was full. You will find this method entirely satisfactory, and you will have bone-dry matches. They can be readily removed by means of a penknife or other sharp-pointed tool, digging them out carefully to prevent breaking them.—E. J. Cutting, Marilla, New York.

Starting a Siphon

In starting the siphoning of liquids with the mouth carelessly, one may get a mouthful, which is rather unpleasant if not dangerous, especially in case of gasoline or other oil. This risk can be overcome by inserting a length of glass tubing in the siphon hose. The tube enables you to see the liquid as it rises and you can stop sucking before it reaches the mouth. Pinch the tube to prevent back flow, place your finger over the open end of the glass tube to hold the vacuum, insert the free end in the vessel that is to receive the liquid and no trouble whatever will be experienced.—W. F. Schaphorst, Newark, New Jersey.





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Mantel Clock Made from Old Alarm

By R. W. MADDEN

MANY an alarm clock that has been discarded as worn out can readily be restored to useful life by a gasoline bath and a little oiling, and may be converted into an attractive mantel clock by making a wooden case for it, as shown in the illustrations. The better the grade of wood

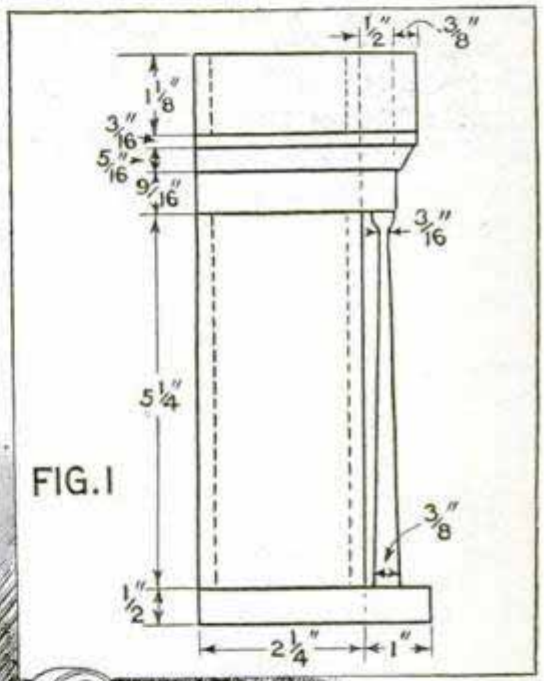
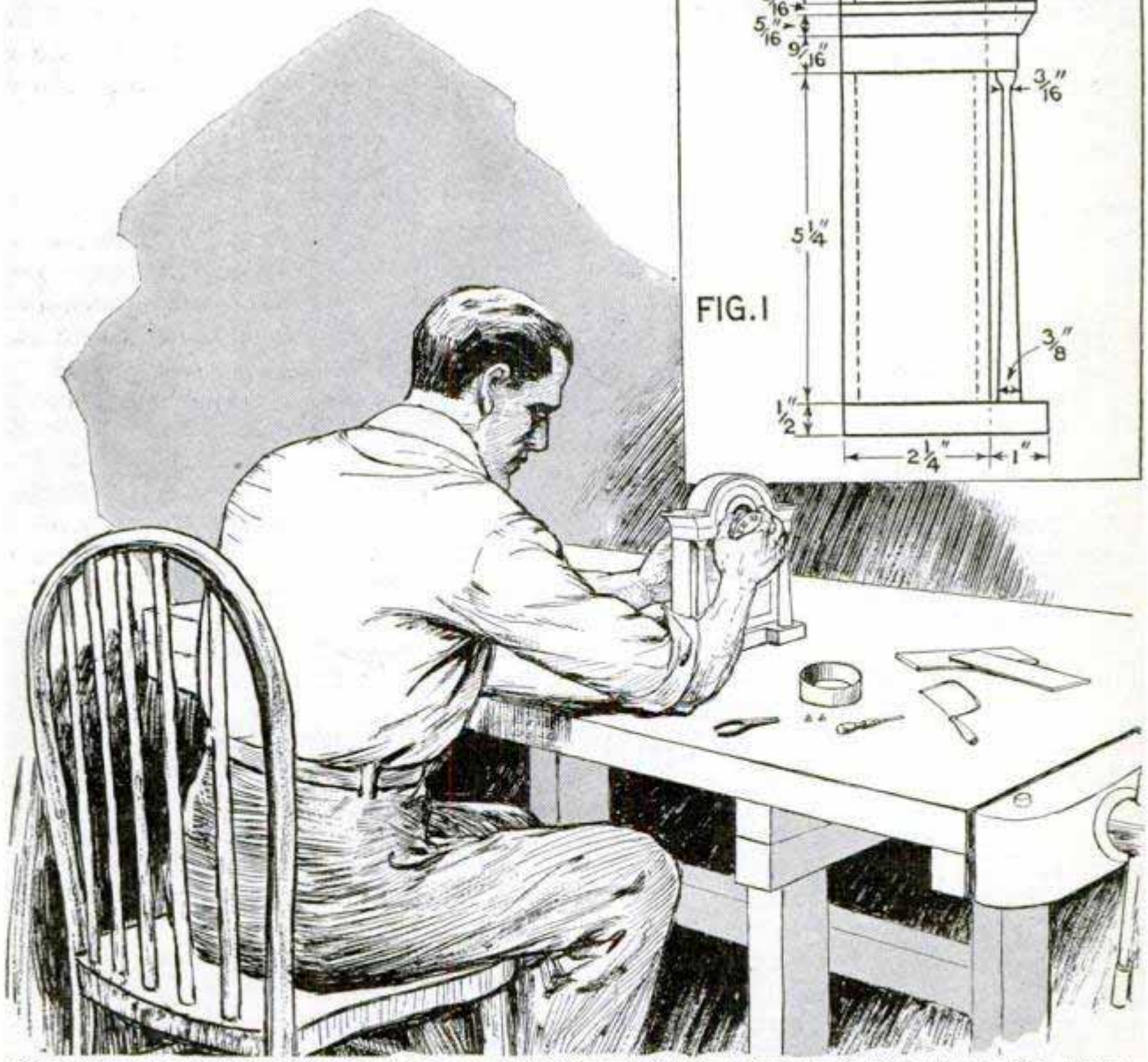


FIG. 1



Those Who Like to Make Useful Things around the House Will Find Pleasure in Renewing an Old Alarm Clock and Mounting It in an Attractive Wooden Mantel Case

used for the case, and the greater the care taken in doing the work, the better will be the finished appearance of the clock. The writer made one of these clock cases of white pine and stained it with mahogany wood dye.

Using ¼-in. wood, first make a rectangular box, 5½ in. wide, 2¼ in. deep and 7⅜ in. high. The front and back should overlap the sides so that no joints will be visible from the front. The edges should be glued and nailed together with small brads. Carefully scribe the circles on the front and back, where the clock is to be located, and cut them out with a coping saw. These circles should be smaller than the face of the clock, so that they will hold it securely. The curved top is formed by steaming a piece of thin wood, 5¾ in. long and 1¾ in. wide. Boiling the wood in water will also make it pliable, but has a tendency to cause it to become spongy. The wood can be bent around a large tin can, tying or clamping it in position until thoroughly dry. Next, cut out the front section, which fits under the curved top. This piece should be ½ in. thick, 1 1/16 in. wide and 6 in. long. A piece of ¼-in. wood, 1 in. wide and 2¼ in. long, is then laid on each side of the curved section, flat on the top of the case. Care should be taken to join all the edges well. The top molding is now applied. It is ⅜ in. by ½ in. wide. This can be either purchased or made. In the latter case, take a piece of white pine of the required dimensions and burn in the round or concave part with a heated rod or carve with a gouge of proper sweep. The charred surface is removed by rubbing with sandpaper wrapped around a rod. To bend the molding for the top curve in front, it is necessary to cut slots every ¼ in. on the back side. The base, made of ½-in. wood, is then cut as indicated in Fig. 3. If a lathe is available, turn down the front pilasters or columns. A disk of thin wood is hinged on the back of the case to close the opening and a small turn latch can be provided to hold it closed.

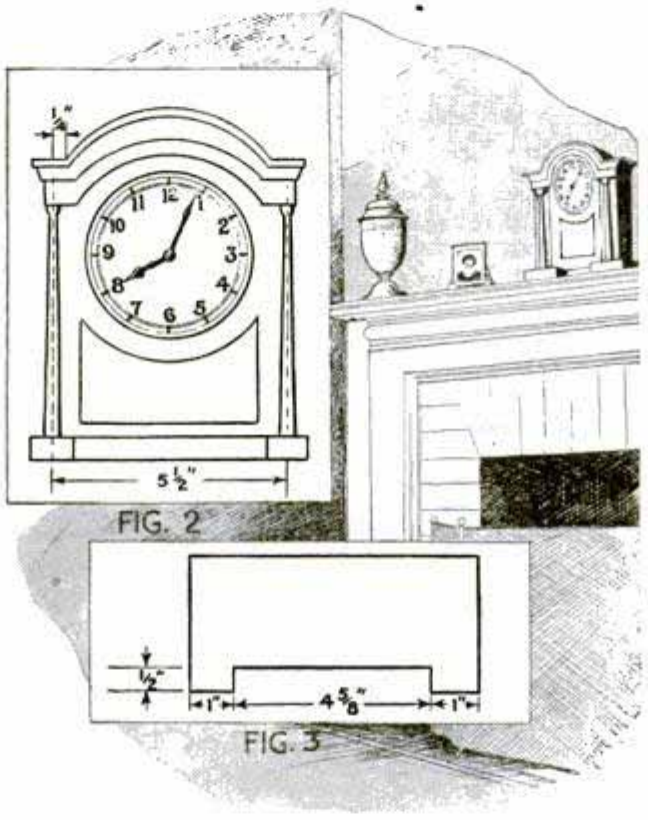


FIG. 2

FIG. 3

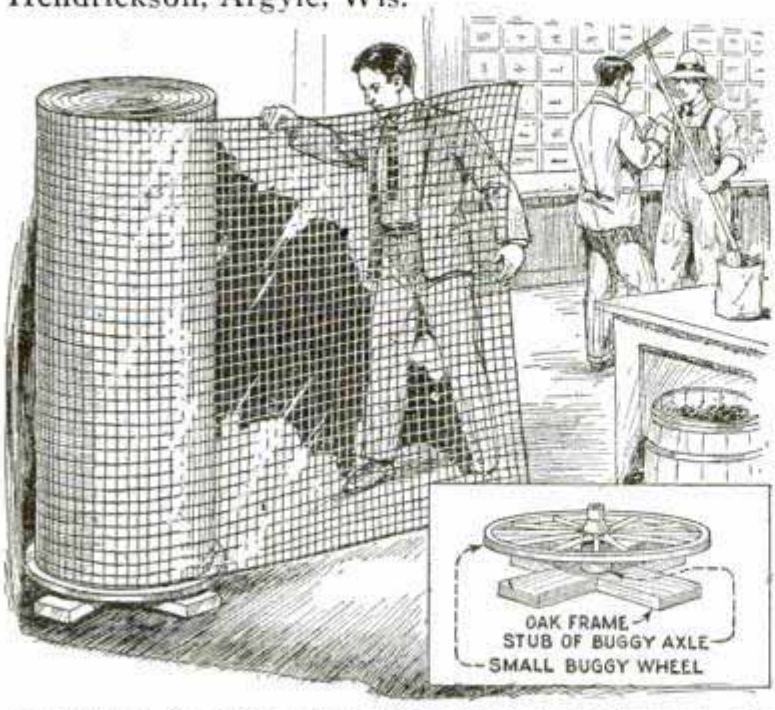
All joints must be thoroughly sandpapered, as a small dent or depression will show up distinctly after the case has been finished, and a filler should be used before stain is applied. This is particularly necessary on end grain. Apply as many coats of filler as the wood will hold, or until a wax-like deposit covers the surface. Scrape off the surplus and stain the case with wood dye. Then give the case an application of white shellac. After letting this dry for 24 hours, three coats of varnish are applied, each coat being left to dry thoroughly and then rubbed down with powdered pumicestone and water before applying the next. Use a large brush with stiff bristles for this purpose, dipping it first in water and then in the pumicestone.

It may be necessary to provide a new face for the clock, if the old one is soiled. Remove the hands and then the face, which can be traced on a similar disk of good manila paper. With black India ink, make the numerals, using a fine lettering pen, such as a Gillot 303. Omit the small alarm dial on the face. The method of attaching the clock in the case depends on the construction of the clock used. After fitting the works in the case, the front ring around the face can be either gilded or gold-leafed. To apply gold leaf it is necessary first to brush on a coat of japan gold size. This is allowed to set for about five minutes until it becomes sticky, so that you can hear a slight snap-

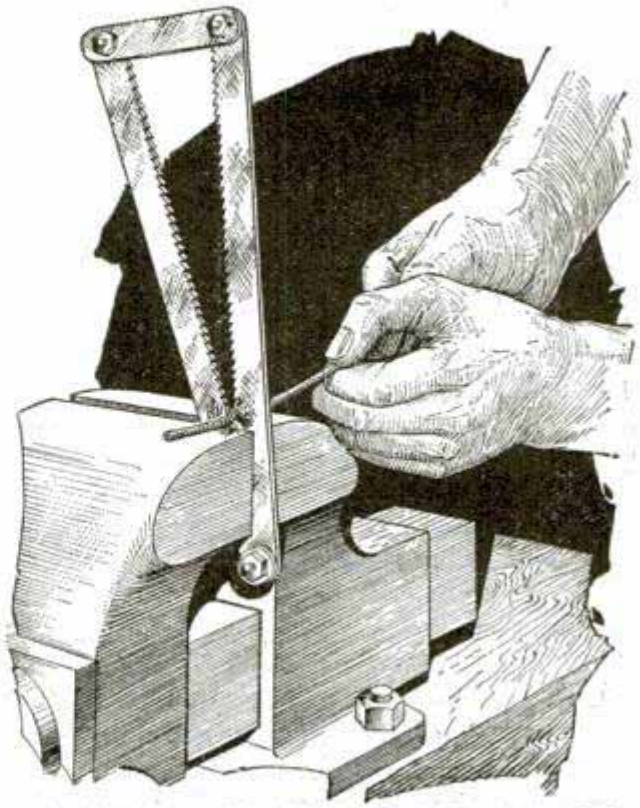
ping sound when pulling the finger away after touching it. The leaf, which comes backed on sheets of tissue paper, can then be put on, after cutting it into strips of the most suitable size for the purpose. After the leaf, with the tissue paper still attached to the back, is applied as evenly as possible, smooth it out with a camel's-hair brush, about 1 in. wide. Burnish the paper with the back of your finger nail, and then remove the paper. If there are any rough edges of leaf, press them down carefully with the brush. After the size has dried overnight, give the leaf a coating of transparent lacquer, which will prevent tarnishing.

Turntable Dispenses Poultry Netting

In a hardware store where floor space was rather limited, considerable inconvenience was experienced in the sale of poultry netting, as there was not enough space to lay the rolls down for measuring off to the desired length. To facilitate the work, the owner made the revolving rack shown in the drawing. The base was made of oak, two pieces being used as indicated. A hole was drilled at the point of their intersection to receive the stub of a buggy axle, with a small wheel mounted on it. The rack could then be revolved so that the netting could be unrolled, measured and cut off without any trouble.—G. E. Hendrickson, Argyle, Wis.



Turntable in Small Store Found Convenient for Storing and Dispensing Poultry Netting



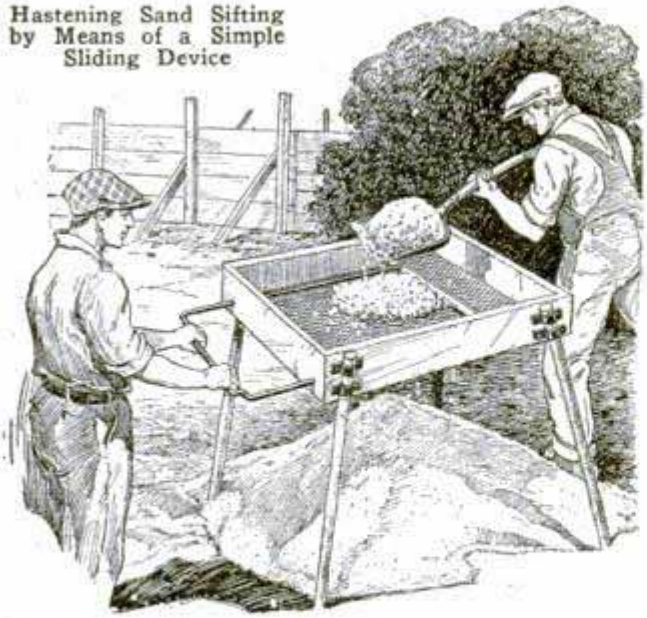
Device Made from Hacksaw Blades Is Useful for Stripping Insulation from Wire

Wire Stripper Made from Hacksaw Blade

Anyone doing electrical work will appreciate this wire stripper. It is made from two pieces of fine-toothed hacksaw blade, and will quickly remove the insulation from small or large-gauge wire. A blade is cut in half and a hole drilled in each at the cut. This may mean annealing the steel to do the job, after which it should be rehardened. Bolt the original ends together tightly and link the other two with a small rod of steel, using machine screws and nuts. This link should separate them at about the angle shown and the points of the teeth should point toward the crosspiece. In use, the stripper is clamped in a vise and the wire then pulled through the jaws. The saw teeth will remove the insulation quickly and neatly.

¶An ordinary wooden clothespin will serve as insulating pliers when automobile spark plugs are tested; a detached spark-plug wire is pushed into the slot in the pin, so that its end can be held close to the spark-plug binding post without danger of shock.

Hastening Sand Sifting by Means of a Simple Sliding Device

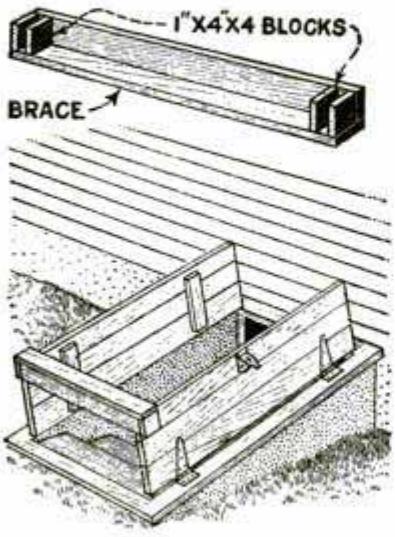


Sliding Scraper Improves Sand Screen

Using the blade of a shovel to scrape damp sand through a sifter will soon ruin the screen. A much better method is shown in the drawing. A bar of ½-in. round steel is bent to a U-shape to fit inside of the sifter. Both ends are threaded so that a length of flat steel, drilled to fit on them, can be held by nuts. In use, the sliding device is moved back and forth, causing the sand to pass through quickly and with less wear on the screen.—G. E. Hendrickson, Argyle, Wis.

Guard for the Cellar Trapdoor

During summer it is often necessary to open cellar trapdoors in order to provide proper ventilation, but this involves a certain degree of danger to children. Accidents caused by falling down an unguarded cellar way can be prevented by the use of a guard rail, as shown in the drawing. It consists of two lengths of 1 by 5-in. wood, the edges of which are nailed together at right angles, and two 1 by 4-in. blocks at each end, with space between them to fit over the edges of the cellar doors. The way of using the rail is clearly shown.—Frank Harazim, New York City.

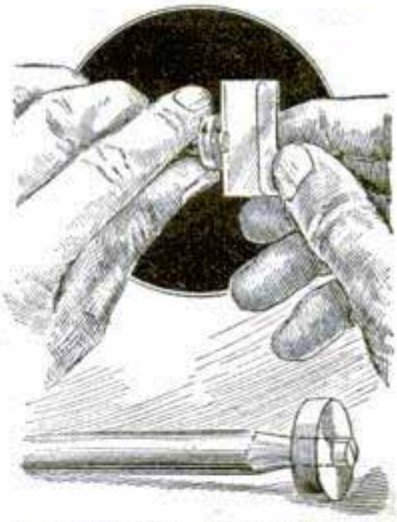


Eyelets for Paper Fasteners Protect Paper

Paper fasteners of the kind that are pushed through holes in the paper and then bent over, are rather sharp and the sheets are torn easily, especially when they are frequently handled. Paper eyelets are obtainable to overcome this trouble, one being placed under the head of the fastener before it is inserted, and the other slipped over the shank of the fastener before it is spread. A good substitute for these eyelets, in case they cannot be obtained, is those found on shipping tags. It is an easy matter to cut them out.

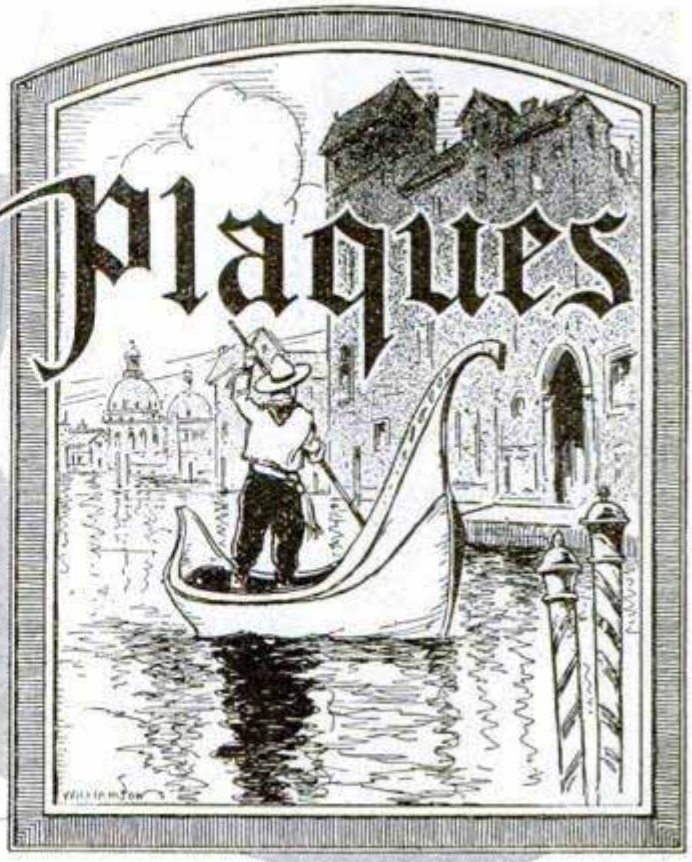
Homemade Facing Tool for Bibcock Seat

Small, flat composition washers used in hot-water bibcocks are very often dented by obstructions catching and lodging under them as the spindle is screwed down to the seat, and this causes them to leak. Trimming or facing them down with a pocketknife blade is not satisfactory, as a perfectly smooth face cannot be obtained in this way. A simple homemade facing device is shown in the illustration. Whittle a stick down so that it can just be slipped through the screw hole of the washer. Force an old safety-razor blade on the end of the stick projecting through the hole as indicated, and then turn the washer against it. The face will be trued squarely and evenly.—F. W. Bentley, Jr., Missouri Valley, Iowa.



¶Machinists, mechanics, airmen, and others who wear goggles, are often bothered by grease collecting on the lenses; carbon tetrachloride removes it instantly.

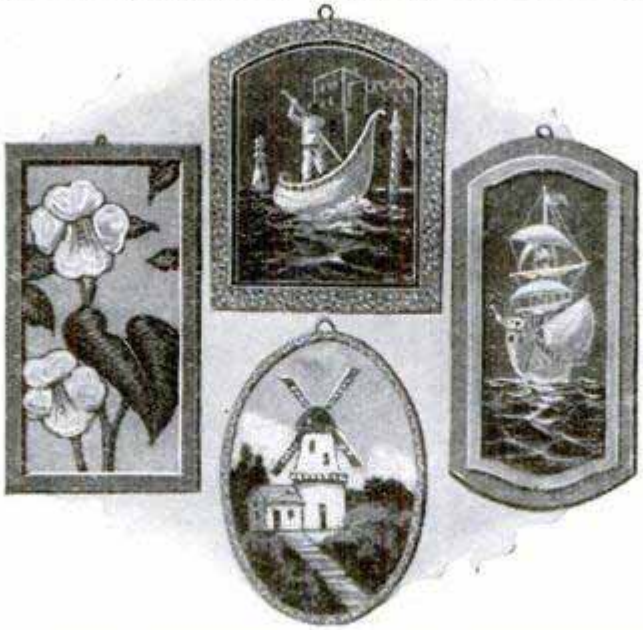
Artistic Plaques ARE EASY TO MAKE



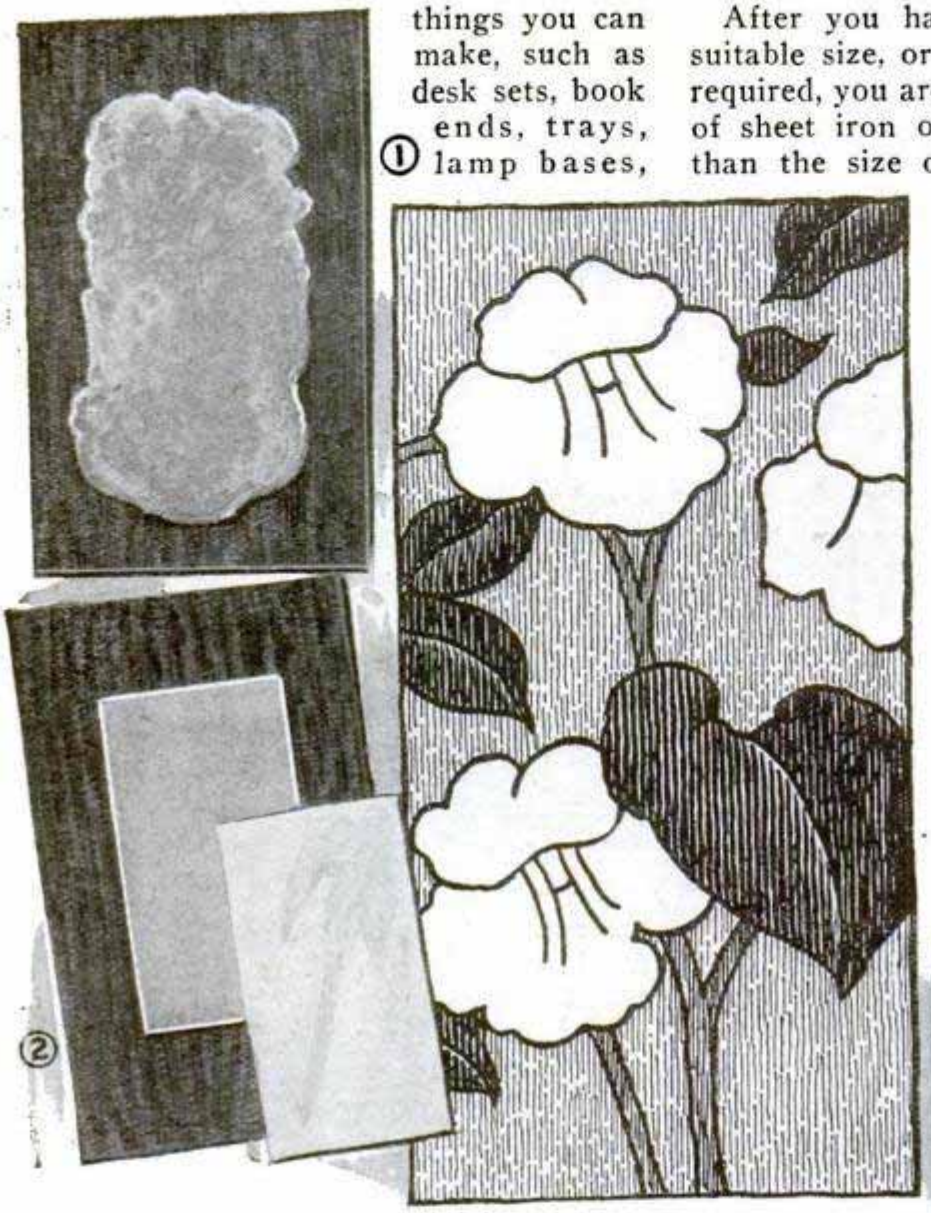
By R. O. Buck

6917 Odell Ave Chicago

THE vogue for gesso and plastic paints has brought back into popularity that most ancient of the arts, modeling. Done in low relief, it is surprisingly easy, and very pleasing results can be obtained with limited skill if a plastic compound is used. This material can be obtained at any art store for a small sum, or even from the 10-cent stores. Its advantage over clay is that it does not require experience in mixing to the proper consistency, nor does it dry hard, but remains in the same condition indefinitely, and may be used over and over again. Of course, the modeling compound is only a means to an end and you will want to preserve your work in a permanent form. This can be accomplished with plaster of paris or a marblelike cement used by dentists. For many purposes, such as plaques, a plaster cast is entirely satisfactory and less expensive than cement. Plaster is used in either case for making the mold. The cast may be painted or enameled to obtain very beautiful effects. However, for articles that require greater strength and durability, the cement is recommended. This cement, which goes under such trade names as Weinstein artificial stone, Healy stone and clover rock, may be purchased from dental-supply houses or from your local dentist. It dries very hard and close-grained and looks much like marble. It is commonly used for casting so-called "marble" statuary.



Many beautiful articles can be made by the use of these materials at small cost of time and money. As the scope of this article is necessarily limited, I am describing only the modeling and casting of plaques of the type shown by the photographs. You need not confine yourself to these, however, for there are many other



candlesticks, jars, vases and even copies of statuary and art pieces.

The first step in the making of a plaque is the selection of a design. If you have skill with a pencil, this will not be much of a problem. Assuming that you have not, I would suggest selecting some rather conventionalized drawing in a magazine illustration or advertisement, or perhaps you will prefer to use one of the drawings shown in this article. Modeling compound has certain limitations which must be recognized at the outset. Fine detail must be avoided and care must be taken that no backdraft or undercutting, which would prevent the separation of the cast and the mold, is present. Of course, if provision is made for dividing the mold into sections, as is done with statuary, you need not guard against undercutting, although it is best avoided at the start.

After you have selected a design of suitable size, or enlarged one to the size required, you are ready to begin. A piece of sheet iron or glass, somewhat larger than the size of the finished plaque, is used to do the modeling on, as any absorbent material, such as wood, soaks up the oil from the compound. Roll the material out smoothly and to an even thickness of about ¼ in. An olive bottle or glass rolling pin is convenient for this purpose. Fig. 1 shows this stage of the process.

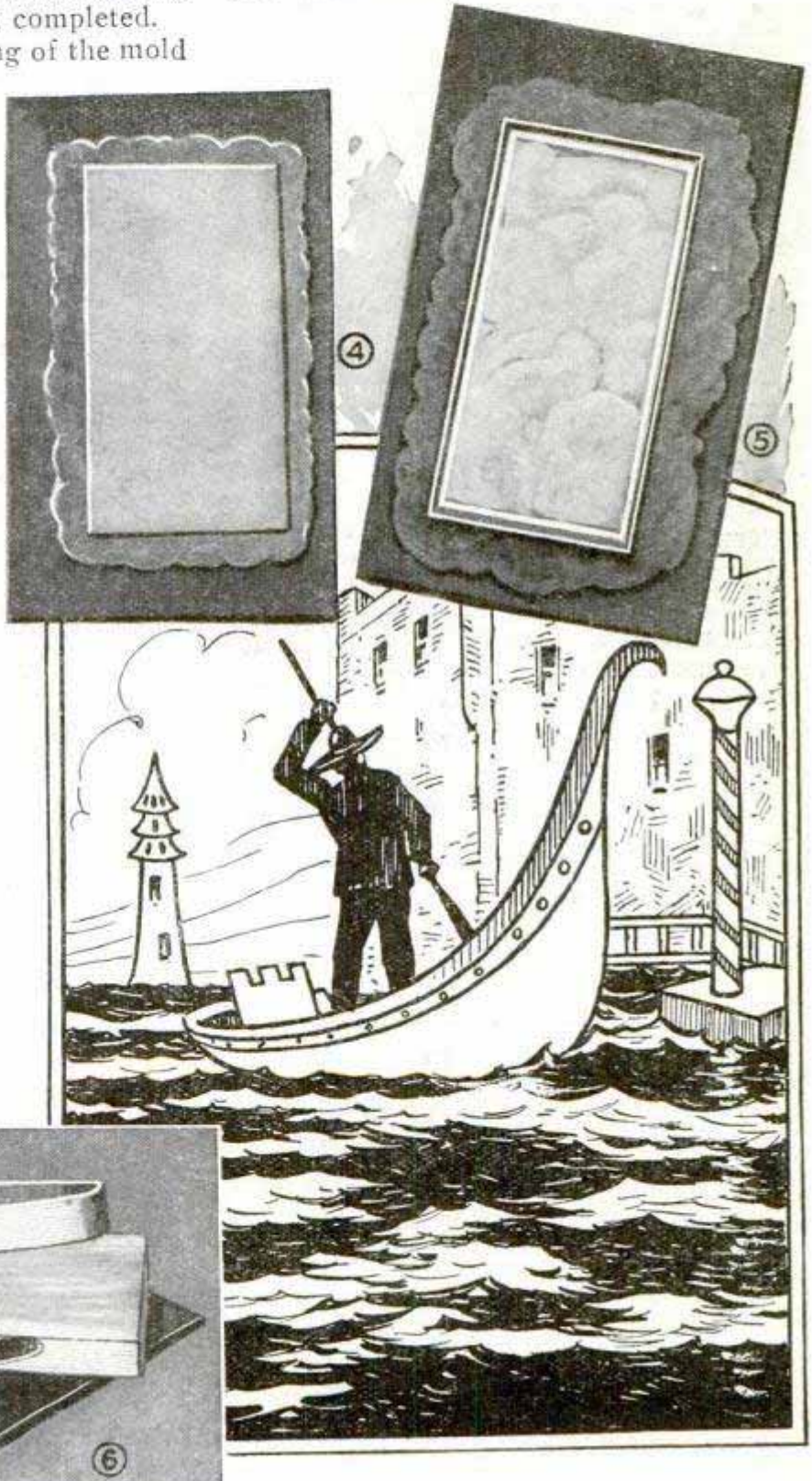
The next step is the cutting of the background to size by the use of a cardboard pattern, as shown in Fig. 2. An ordinary vegetable knife is suitable for this. Modeling tools can be made from slivers of wood that may be cut in a variety of shapes that will suggest themselves to you. They should be sanded so that they will leave the model smooth.

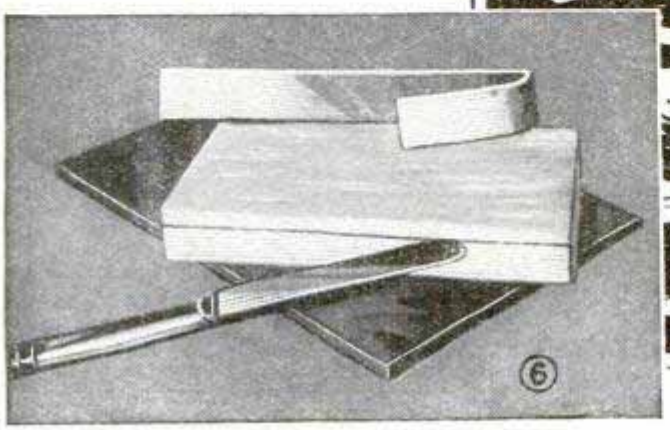
The actual building up of the design is largely a matter of patience and care. The drawing is placed on the surface of the compound and traced with a sharp pencil point to make an impression on the compound. Pieces of the material are then cut to the approximate size and shape of the raised portions of the design and put in their proper positions, and tools are used to work the material into place and to the exact size and shape desired. Parts

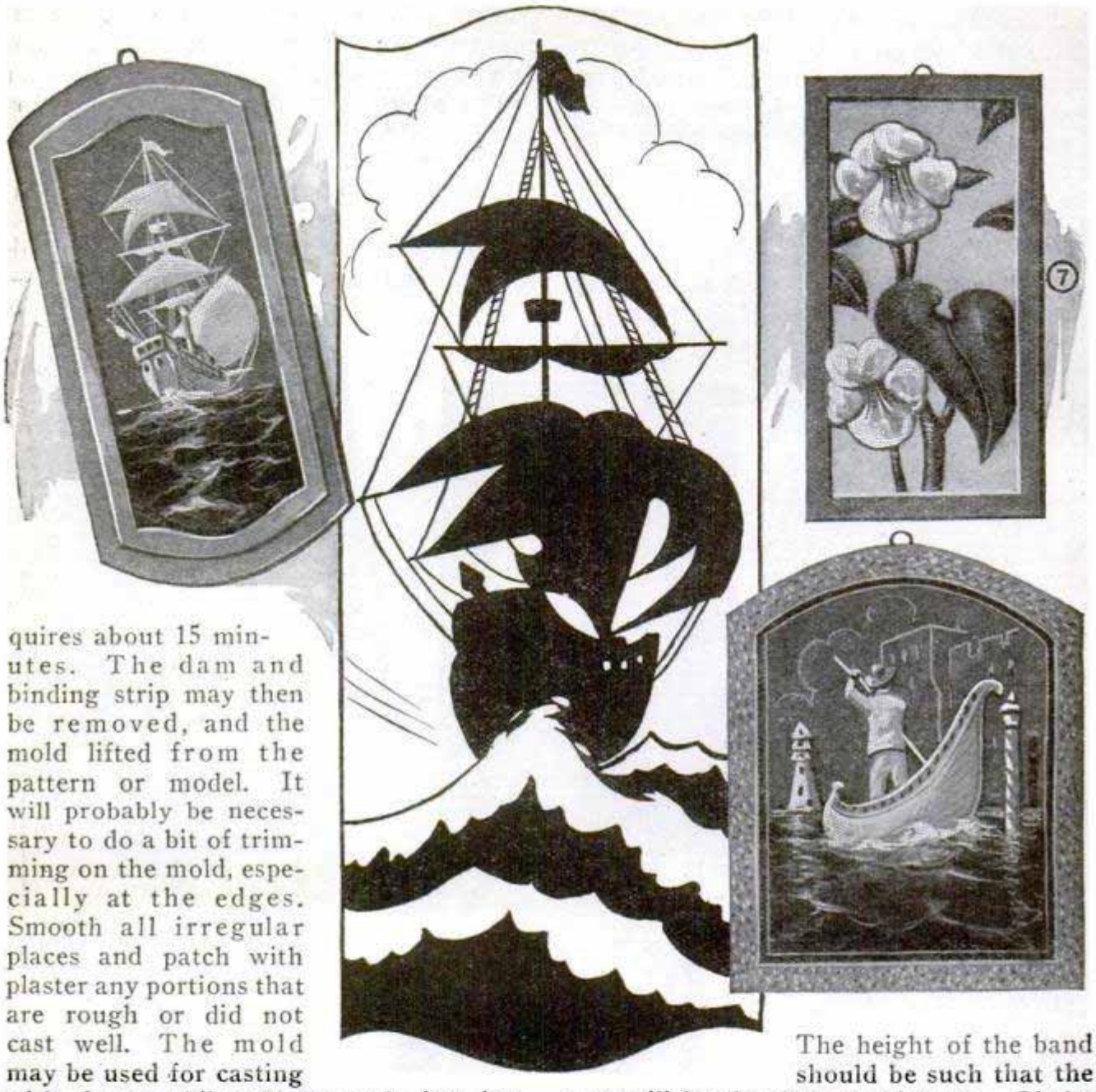
that are to be raised are built up to height above the background. Some detail may be attained by cutting into the raised portions or even into the background. If greater contrast or an appearance of greater depth is desired, a roughening of the background will give this effect. Raised edges are formed by building on strips of the compound. The finished model must look as you wish the casting to be. Fig. 3 shows a model completed.

Now we come to the casting of the mold in plaster of paris. A band of cardboard or tin, about 1 in. high, is shaped to fit around the outside of the model and fastened with a wire or strong rubber band. (See Figs. 4 and 5.) A dam of the compound is forced against the band on all sides to keep the plaster confined. The latter is mixed as follows: Estimate the quantity of liquid plaster required, and fill a bowl with clean water to that amount. Take a handful of plaster and sift it into the water slowly. Keep adding plaster while stirring gently, until little deposits or islands of plaster appear above the surface. This is the saturation point, and only a small amount of plaster should be added after that has been reached. The mixture will then be about the consistency of rich cream. In stirring, the spoon or paddle must be kept below the surface of the water, as raising it out of the water produces bubbles and results in a spongy mold.

The plaster should be poured into the mold slowly. It is best to cover the design only ⅛ in. deep at first, then rap the table sharply to break any bubbles which may have formed from pouring. Fill the mold even with the top of the band and allow the plaster to set. This re-







quires about 15 minutes. The dam and binding strip may then be removed, and the mold lifted from the pattern or model. It will probably be necessary to do a bit of trimming on the mold, especially at the edges. Smooth all irregular places and patch with plaster any portions that are rough or did not cast well. The mold may be used for casting with plaster while still damp; in fact, better results are usually obtained this way.

In order to remove the cast from the mold, it is necessary to employ some separating material. A soap paste is often used for this purpose, but you will have better results with "liquid glass" and oil, sandarac varnish and oil, or collodion. All of them are satisfactory and easily obtained. Cover the entire surface of the mold with the separating fluid, applied with a camel's-hair brush. After it has dried, which will be within a few minutes, a thin coating of oil is applied. Almost any kind of oil will do, but it must be a thin coating so that it does not make bubbles or discolor the cast.

A band and dam are placed around the mold just as they were around the model. The height of the band should be such that the cast will be the desired thickness. If the cast is to be of plaster, the mixing should be done in the same manner as for the mold. Care must be taken to get the plaster into every corner and crevice, and to avoid forming bubbles. A small piece of wire, for a hanger, should be placed in the plaster when it is partly set. In case you overlook this, another method is to drill small holes diagonally from the top edge through the back, so that a light wire may be twisted in for a hanger.

The cast is ready to separate from the mold as soon as the plaster has set. You can tell when it is set by the fact that it will feel quite warm to the touch, because of the chemical action that has taken place. Scrape the edges of both the mold and the cast until the separation line is

visible all the way around. Gently insert the edge of a case-knife blade along this line to a depth of about 1/16 in., as in Fig. 6, and all the way around again. Now, with the full length of the blade in this cut, gently pry the mold from the cast. If it does not yield readily, insert the knife on the opposite side and repeat. The cast should part from the mold cleanly if you have applied the separating material over the entire surface. After the cast is separated, it is ready to be smoothed and decorated. Do the touching up and smoothing while the cast is still damp, as it is more difficult after it is dry and hard.

If the casting is to be made with dental cement, estimate the amount you will need to fill your mold and mix the powder with water to the consistency of thin paste. This material is less liable to form bubbles, so does not require as great care in the mixing as plaster does, but it must be mixed thoroughly.

All dental plasters set slowly; about 24 hours are usually required before they set hard enough to be separated. This depends on the grade of cement used, however, as it can be obtained in quick-setting, medium and slow grades. A wire hanger should be inserted into the plaster when it is only partly solidified, as it is difficult to drill this material later. It may be necessary to tap the mold gently with a small wood block to start the separation. I found sandarac varnish better than the other materials for separating cement. This material can be obtained at the same place you get the cement.

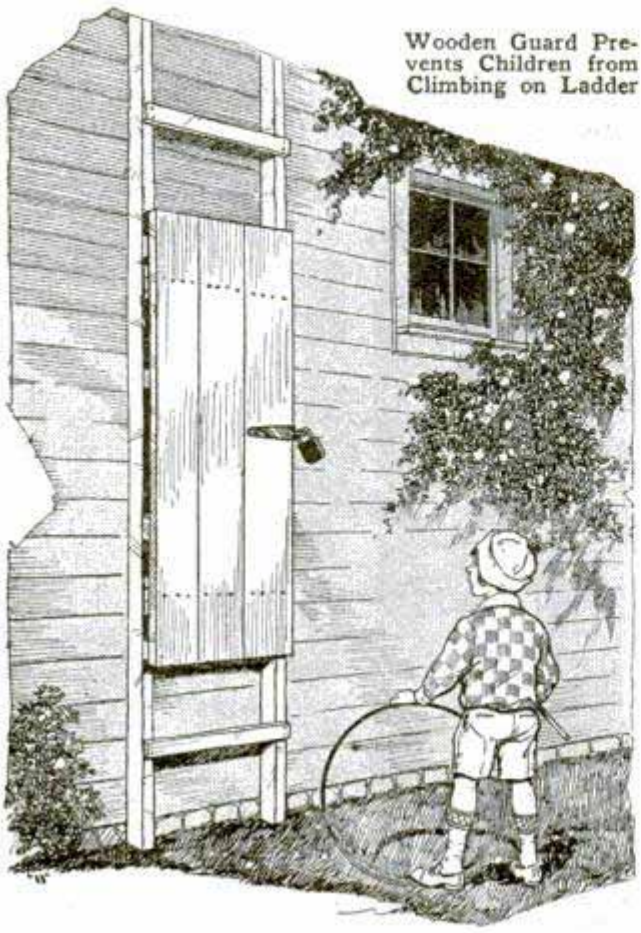
The cement castings are pure white and resemble marble very closely, but may be painted or enameled as desired when thoroughly dry. A bit of dry color is sometimes added to the dry cement, to give an ivory tint, which has a very pleasing effect.

Various shades of bronze, such as rose, fire, green, lilac, blue silver and old gold produce beautiful effects on plaques of either material. They may be bought in small quantities, at most paint stores, in dry form to be mixed with a bronzing liquid. It is important that the plaques or other castings to be decorated be thoroughly dry before bronze paints or enamels are applied, as the slightest bit of moisture will cause the paint to flake off in spots. Brushing lacquers are also suitable for this work and give very pleasing velvetlike results in combination with the above-mentioned bronzes.

Showcard or poster colors may be applied to casts of either material while still damp, and are particularly suitable where brilliant color effects are desired. Painting the entire plaque in a solid color, such as blue or red, and then high-lighting or touching up the raised portions with one of the bronzes, is one of the simplest, but not the least pleasing, treatments. Fig. 7 shows a conventional flower plaque completed, and, though it is impossible to do justice to the coloring with black and white, some idea of the possibilities is suggested.

The plaque in which the windmill is the central figure was painted in shades of blue and old gold with a border of black and stippled gold. The Venetian boatman is effective in brilliant orange with red-gold high lights, while the ship proved to be most attractive in a simple treatment of shades of sepia with the high lights rubbed somewhat lighter. The border was done in dull gold.

A mold can be used repeatedly, but it is then advisable to repeat the oiling for each casting and add a coat of separating fluid also, if many duplicates are to be made.



Wooden Guard Prevents Children from Climbing on Ladder

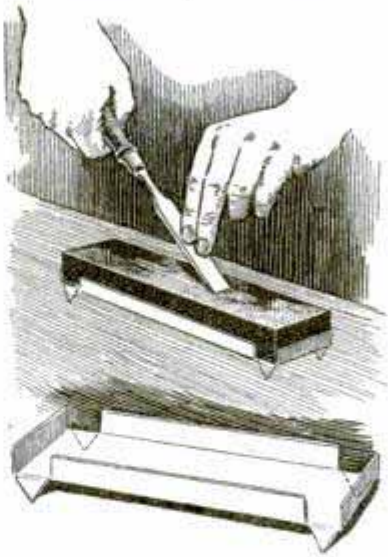
Guard for Stationary Ladder

Children often unthinkingly risk hurting themselves by climbing ladders that are permanently attached to tanks, barns and other buildings. To prevent this, a guard of the kind shown in the drawing may be provided. It is simply a wooden door of the same width as the ladder, hinged to one side and with a hasp on the other so that it can be secured with a padlock. The guard should extend over three or four rungs at least, so that a boy would not be able to climb over it, even if, in spite of its presence, he should attempt to do so.—F. G. Rempe, Oakland, Calif.

Precautions to Be Taken When Soldering Gasoline Tanks

Numerous serious accidents have occurred from attempts to stop leaks in gasoline tanks by soldering, brazing or similar processes. The use of an open-flame torch for work of this kind involves great danger, but under certain conditions even a soldering iron may cause an explosion. The danger is due to the inflammable fumes left in a tank after the gasoline has been drained out, and these fumes are really more dangerous than the gasoline itself. If one is not certain that all the explosive fumes can be removed from a repair job, it should not be undertaken, for the loss of the job is preferable to the loss of a hand, eye, or life itself. The best method of removing the fumes is as follows: First drain all the gasoline, providing a vent to allow the free entrance of air to replace the gasoline. Most tanks have a petcock or plug at the bottom, which can be opened for this purpose. After the tank has been thoroughly drained, it should be flushed by means of a water hose, making sure that the tank is filled with water all the time, the water entering the upper hole and escaping through the lower one. After the tank has been flushed for about 15 minutes, all the water is drained out, the inside dried by means of compressed air, and the tank is then placed on a hot-water or steam radiator, or other fireless heating device. When placed on the radiator, the tank should be set so that the largest hole is at the top to permit the free escape of fumes, and the smaller hole at the bottom to allow the entrance of air. These precautions may appear to be exaggerated, but the number of accidents that arise from attempts to solder gasoline tanks warrant them.

Non-Slip Holder for the Oilstone



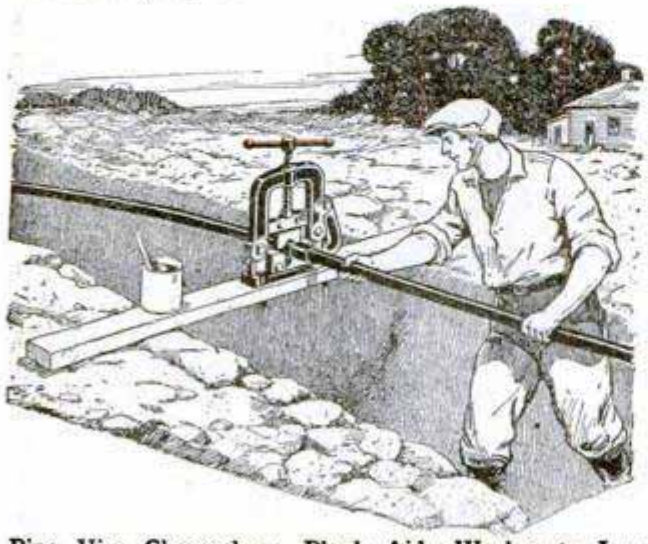
When using an oilstone, inconvenience is often experienced due to the lack of steady support for it. Of course, it can be held in a vise, but when the latter is in use or is not available, a non-slip holder will be found handy. It can be made from a piece of sheet metal, cut and bent to the shape indicated. Such a holder provides pointed feet which grip the surface of the workbench tightly when pressure is applied to the stone.—Fred E. Hake, Cincinnati, Ohio.

Sal-Ammoniac Stops Casting Leaks

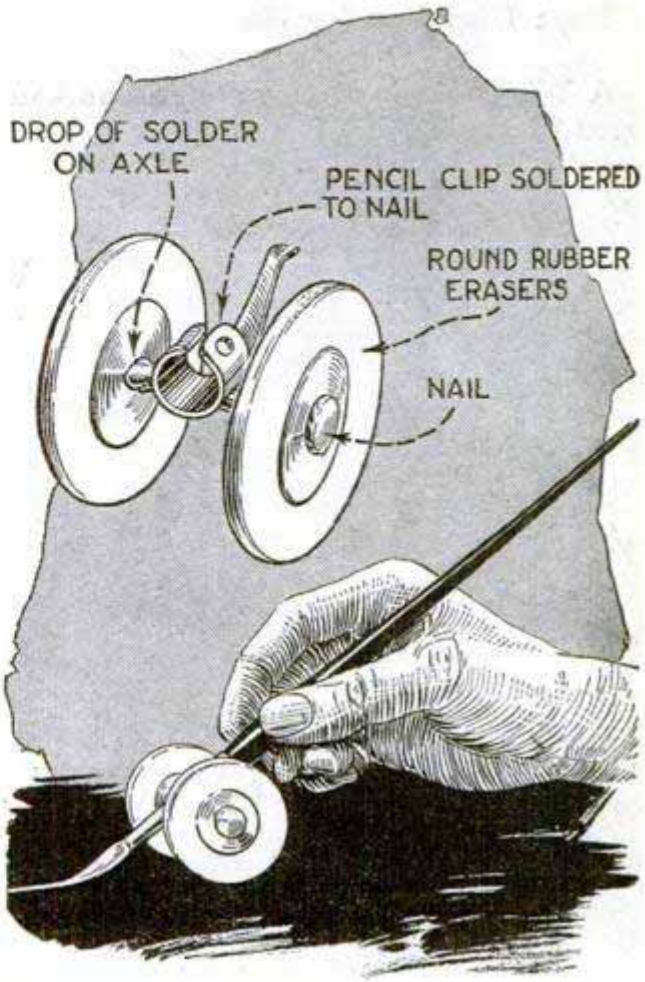
Small leaks or flaws in castings, that show seepage of liquid when filled, can be temporarily repaired with common sal-ammoniac. Dissolve ¼ lb. of this in warm water and let it cool. Pour the mixture into the casting and allow it to remain undisturbed for 24 hours. If it leaks through too fast, place a bucket underneath to catch it. Refill the casting whenever necessary. The leak will gradually become filled with a deposit of rust and it should be water-tight in 24 hours. Of course, this repair will stand no pressure, and a permanent one should be made as soon as possible.

Vise Helps Pipe Laying

Laying a long stretch of piping involves the difficulty of screwing new lengths onto those already laid. It is necessary to hold the end of the pipe that is placed with one wrench, and turn a coupling and a new length with another. The job is usually done by two men, but it can be made so simple that one man can do it without being handicapped in the least. All that is necessary is a pipe vise securely clamped to a plank, which is long enough to be laid across the ditch as shown. The end of the piping is securely clamped in the vise, and a new length can readily be screwed in. The worker can usually do most of this by hand, grasping one end of the pipe while the other end is supported by a second plank. The tightening is, of course, done with a pipe wrench.—James H. Brundage, Katonah, N. Y.



Pipe Vise Clamped on Plank Aids Worker to Lay Piping Single-Handed



Simple and Easily Made Device Which Helps Amateur Stripers Do a Good Job

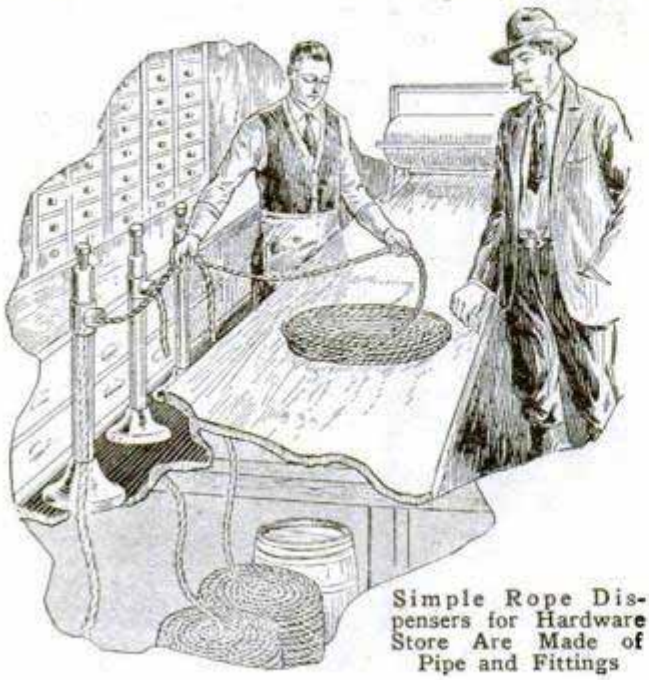
Device for Painting Stripes

Most people who paint their cars have considerable difficulty with the striping, which under ordinary conditions is an expert's job. With the aid of the simple device shown in the drawing, anyone who is careful can do the work satisfactorily. It is merely a rest for the brush and consists of a nail, pencil clip and two typewriter erasers of the disk type, assembled as indicated. The nail must be a sliding fit in the holes of the erasers, which are kept in place by means of a few drops of solder applied to the nail. In use, the brush is held by the pencil clip which is also soldered to the nail. It will be found, with this device, that a straight line of the same width throughout can be drawn even on curved and irregular surfaces.—S. A. Marshall, Jr., Rome, Ga.

¶An easy way to clean a pipe is to hold the end of the stem against the valve of a compressed-air tube, such as is to be found in nearly every garage.

Rope Dispenser for Hardware Store

A Wisconsin hardware dealer who had been in the habit of storing his supply



Simple Rope Dispensers for Hardware Store Are Made of Pipe and Fittings

of rope in the basement, where it would be out of the way, arranged to dispense it by threading the strands through holes drilled in the floor, so that any desired length might be drawn up and measured out. This, however, necessitated tying a knot in the end of each rope to prevent it from dropping down through the hole. The simple pipe arrangement shown in the drawing prevented this trouble. Lengths of 1¼-in. pipe and fittings were used as standards. They were attached to the floor over the holes and the rope was threaded through as indicated. Into the upper end of each, a short piece of 1-in. pipe, equipped with a cap, was inserted to drop down past the opening of the tee. In use, the rope is pulled out to any desired length and is prevented from dropping back into the basement by the 1-in. pipe, which rests on it.—G. E. Hendrickson, Argyle, Wis.

Extension Die Holder

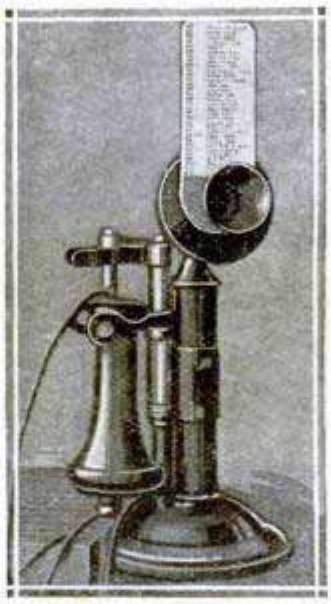
We often had some small job where an extension die holder was needed, as, for example, in the threading of auto-spring clips. To facilitate this kind of work, we improvised a holder which cost us nothing to make and saved considerable time. It consisted of an old auto-wheel hub, obtained from the junk pile. The flange was cut off, and a setscrew was threaded into the side to hold the die securely in the end. A handle was, of course, also provided.—H. W. Swope, Danville, Pa.

Calculating Number of Studs Required in a Wall

Studs, rafters and joists in frame buildings are usually spaced 16 in. from center to center. To calculate exactly how many of these are required in a wall of known length, divide the total length of the wall by 4, multiply by 3 and then deduct 1. For example, if the length is 20 ft., it will be found that 14 studs are required. In cases where one-fourth of the total distance is not even, the last space will be less than 16 in., and then you do not deduct 1. For example, if the wall length is 21 ft., which gives 15¾ studs, 15 studs are used. The fraction represents exactly 12 in. in this case. Where you have fractions of an inch, forget them. With rafters you do not deduct one, as you start and finish with a rafter. The same is true of joists.—T. E. Jeffries, Charleston, W. Va.

Phone Directory Saves Time

Busy executives who use their telephones considerably every day, will find



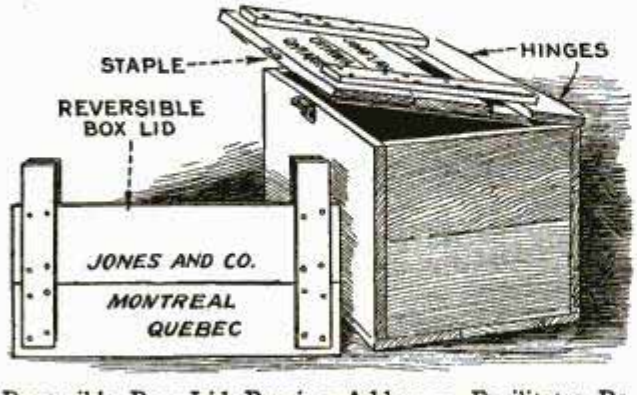
the phone directory shown in the photo a real time-saver. In one factory a number of these directories were made by photographing a typewritten original and printing as many copies as were necessary. Each print was glued to a piece of fiber board, in which a hole was cut at one end to fit the threaded section of the telephone mouthpiece. This was screwed up tight to hold the card. If desired, the card can be made to extend both above and below the mouthpiece so that a list of approximately 100 names will be in view.—E. H. Flaharty, Paroo, Wyo.

Covering Ignition Wires

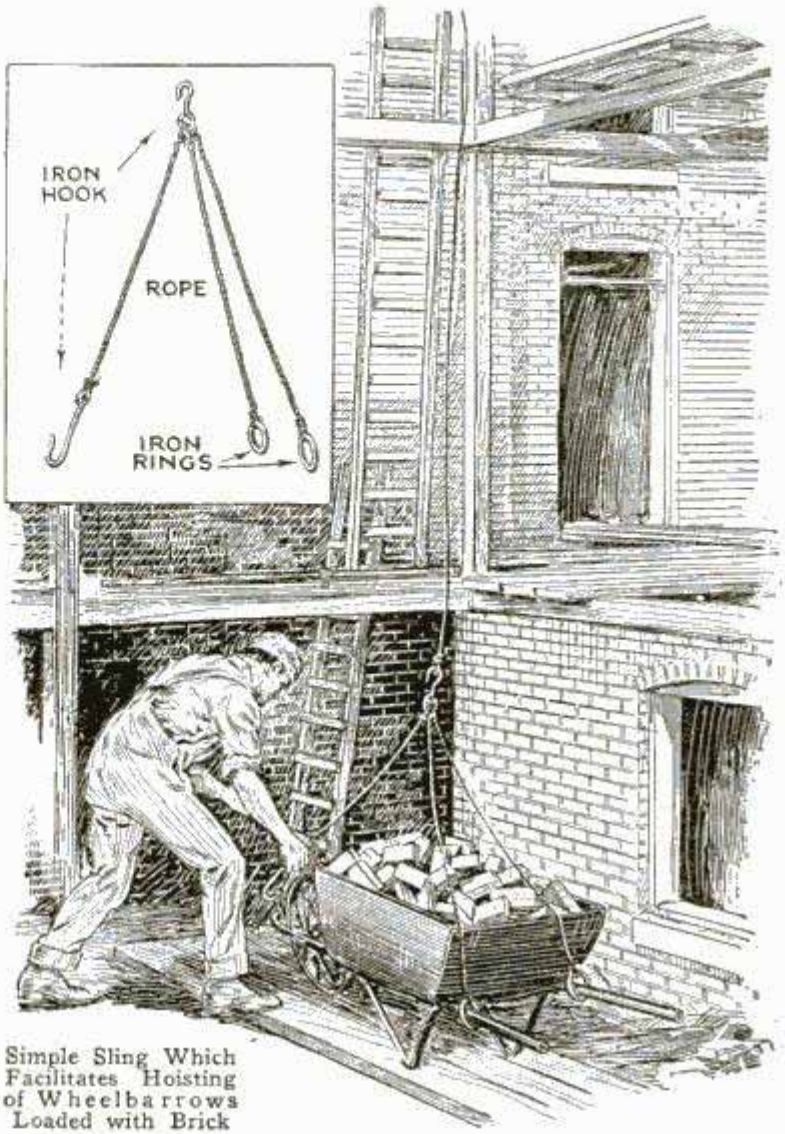
High-tension cables and other insulated wiring on automobiles may be short-circuited after they have been in use for some time, causing the current to jump through the insulation instead of jumping across the gaps in the spark plugs. This is very annoying, as spark plugs will work well when they are out of the cylinders, but will not spark under compression. The trouble can be remedied by covering the cables with old rubber hose, which is much cheaper than buying new cables.

Reversible Box Lid

A reversible box lid, which can be locked as securely as one of the hinged type, is convenient for boxes which are used to carry material to distant points and then returned to the sender. Instead of a full hinged lid, only one board of it is hinged, as shown in the drawing. The remaining part, which is loose, is provided with extending cleats that straddle the hinged section. A staple is, of course, driven into the edge of the lid and another on the box to permit locking. When locked, the lid is securely fastened, side movement being prevented by the snug fit of the under cleats against the sides of the box. To render the use of the box simpler, the address of the receiver is painted on one side of the lid and that of the sender on the other.—Harry Moore, Montreal, Can.



Reversible Box Lid Bearing Addresses Facilitates Return Shipments



Simple Sling Which Facilitates Hoisting of Wheelbarrows Loaded with Brick

Hoisting Sling for Wheelbarrows

During the construction of a brick building, the task of hoisting the bricks to the third floor was greatly facilitated by the use of the sling shown in the drawing. It is fastened to the wheelbarrow at three points, so that the load can be hoisted safely, and when the barrow reaches the upper floor it can be wheeled to the particular place where the bricks are needed. The sling consists of three equal lengths of strong rope, one—for the front end of the barrow—being provided with an iron hook, while the other two are tied to iron rings, which slip over the handles of the barrow. This method has been found satisfactory for the average-size barrow, which will not be top-heavy in this way. —Chas. Latour, Jr., Plattsburg, N. Y.

¶Do not try to ream out more than 1/64 in. with a hand reamer.

Convenient Mask for the Bee Keeper, Made from a Hat, Screen and Cloth

Face Protector for Bee Keepers

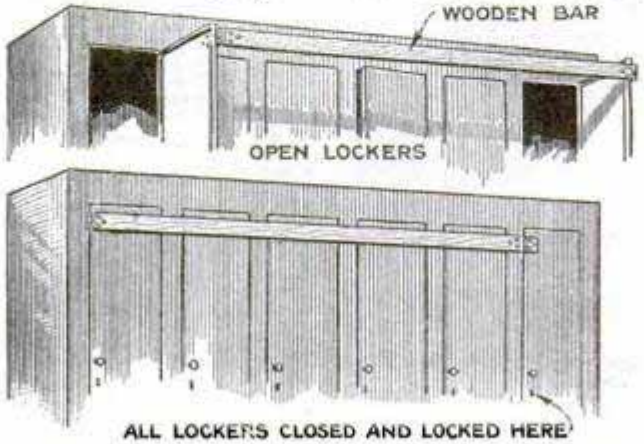
A simple face protector or mask for bee keepers can be made from an old broad-brimmed hat, a piece of fine-mesh screen, a light metal hoop and a piece of netting or cloth. The screen must be long enough to reach around the rim of the hat to which it is sewed. The other edge is attached to the hoop and the overlapping edges of the screen are sewed together. It will be found most convenient to have the screened section about 6 in. wide. The piece of netting or cloth is sewed onto the hoop and the overlapping edges stitched together. The cloth part must be sufficiently large to cover the user's shoulders and chest. It extends down to the waist. If the bees are not docile, cotton gloves should be worn, especially by persons unfamiliar with bees. When handling bees one should move about slowly and quietly, and refrain from noises or sudden, jerky movements, for the bees are easily excited and are then more likely to sting. —Milton A. Ayers, San Francisco, Cal.

Finishing Wood Patterns

The finish on a pattern has a distinct effect on the finish of the casting produced. A rough pattern cannot leave a smooth mold in the sand. The dampness of the molding sand and the cleaning of a pattern by washing with water from a hose bring out all the "hair" from the surface of the wood, leaving it covered with small raised particles. Cleaning patterns by the use of water is, therefore, poor practice, as is also drying them near steam pipes. Places where the end wood appears on the surface of the patterns are most difficult to get smooth and keep smooth. After once smoothing the pattern, the least dampness brings out the roughness again to a greater degree than on portions with the grain. To prevent this, prepare some glue water and with a brush apply two coats to the end grain of the wood. This fills up the pores and effectively prevents "pulling out." Over this apply finishing paint as usual. This kink is also often applied to hardwood furniture.

One Lock for Six Doors

Most shops are equipped with metal clothes lockers for the convenience of employes, each of whom holds a key for his locker. One shop did not find this individual-key system satisfactory, mainly because of the frequent loss of keys which gradually resulted in most of the lockers being left open. To overcome this, a multiple-locking system was devised whereby six lockers are secured with one lock. Hinges were attached to both ends of a wooden bar, and fastened to the first and last doors of the set of lockers as shown in the illustration. In the shop where this idea has been adopted, it is the duty of one man to lock and unlock the last door in each set at certain times. This gives satisfaction to everyone, and it is impossible to tamper with any of the lockers during working hours.



Automatically Closing All Doors of a Six-Compartment Locker by Locking Only One

Safety Guard for Friction Drill

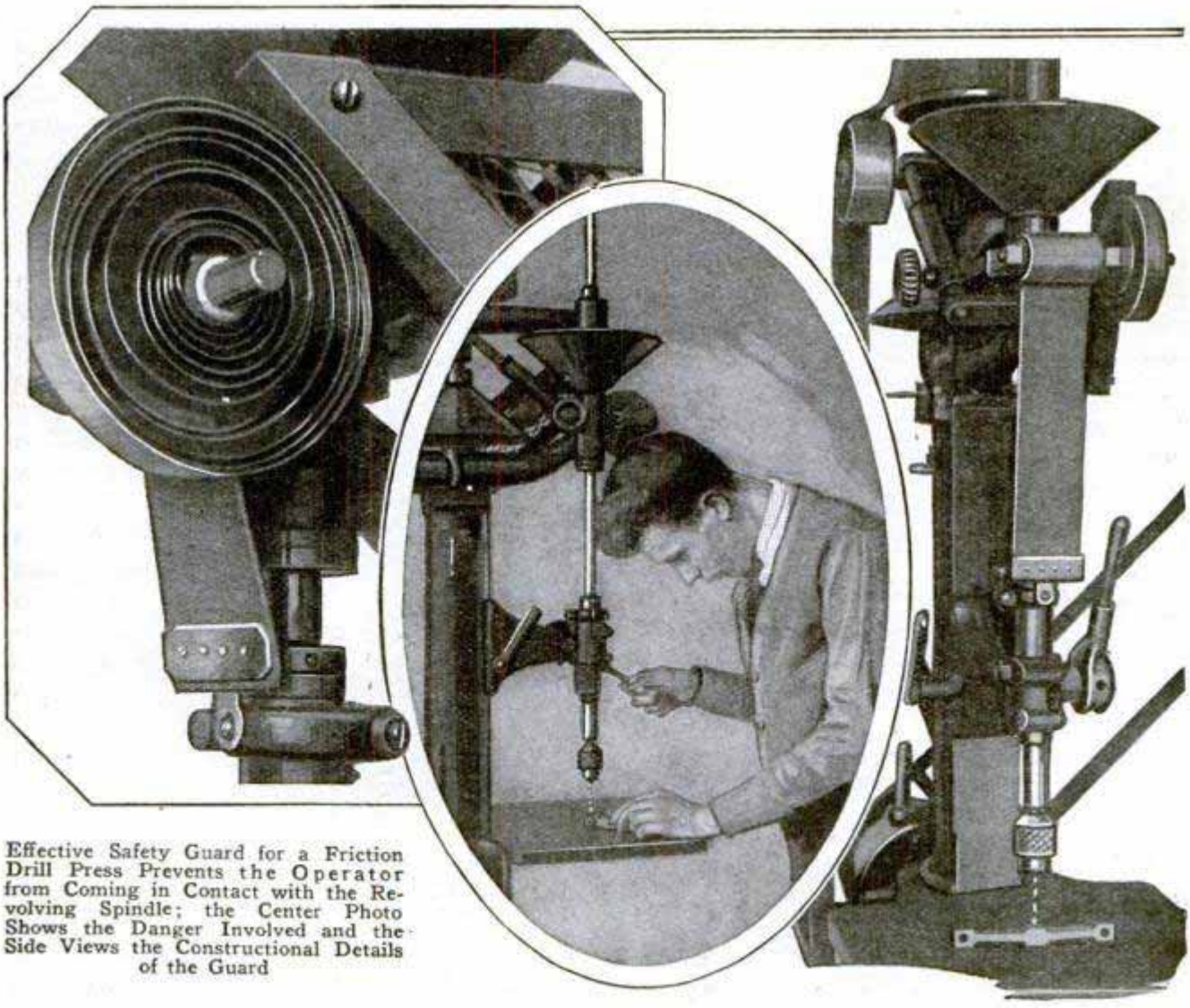
By ALBERT A. BAILLEY

HAVING a friction-driven drill fitted with a sliding head, we found it advisable to guard the spindle to eliminate danger of accident to the operator.

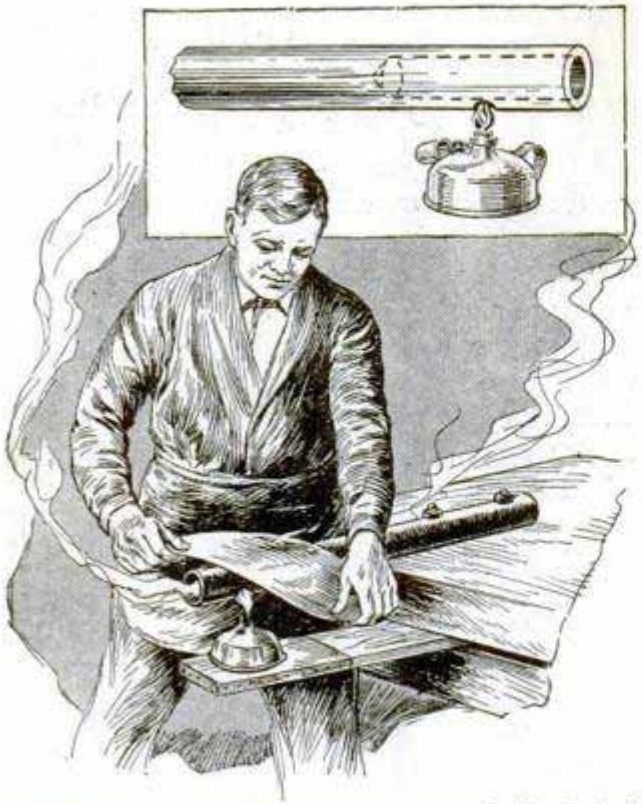
The problem involved was the design of a type of guard that would automatically rise and descend with the spindle. Attaching a metal shield to the sliding head in the usual way was impossible in this particular case, as it would have to project out too far, in order to provide sufficient clearance for the large cone. The guard we finally devised, which proved to be entirely satisfactory, is shown in the photos. It was made from an old inner tube, an old clock spring and tin can. A bracket, supporting a short shaft to which the clock spring was attached, was provided on the frame of the drill, just in front of the revolving cone. The inner tube was cut open to make a flat length of rubber, one end being attached to the short shaft and the other to the spindle bracket, as indicated in the side views.

The inner tube is always kept under tension by the clock spring, which is anchored to the inside of the tin can. The latter, which, of course, has to be covered to keep the spring safely confined, is rigidly attached to the bracket. With this arrangement, the spindle can be raised or lowered at will and the inner tube always remains taut in front of the spindle. The inner tube will effectively prevent the operator from accidentally coming in contact with the revolving spindle.

This device, of course, is adaptable to many other types of drill press where the same danger exists, and is especially suited to the school shop.



Effective Safety Guard for a Friction Drill Press Prevents the Operator from Coming in Contact with the Revolving Spindle; the Center Photo Shows the Danger Involved and the Side Views the Constructional Details of the Guard



Bending a Strip of Thin Wood over a Polished Axle or Pipe Heated with an Alcohol Lamp

Simple Way of Bending Thin Wood

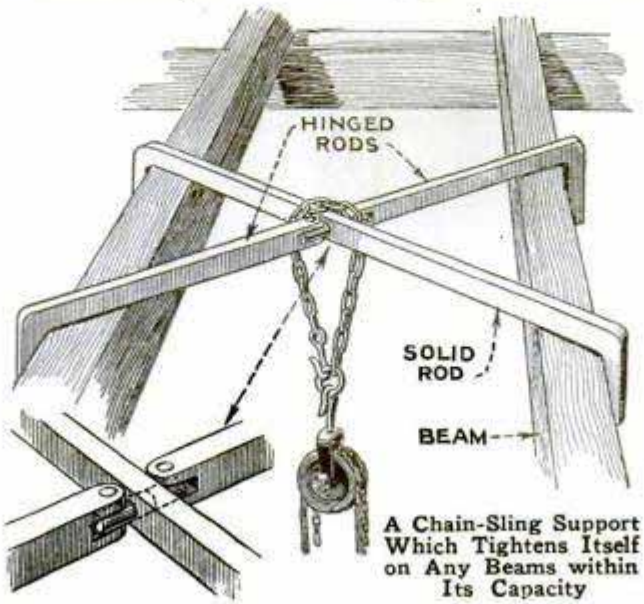
It is often necessary to bend a thin piece of seasoned wood to conform to some shape or pattern, as in violin making or repairing. This can be done easily in the following manner: Take a polished shaft, such as the axle of an automobile, and drill a hole in the end, about 4 in. deep, so that the wall will be about ⅛ or ¼ in. thick. Drill a counterhole, ½ in. in diameter, through the shell, about 2 in. from the end. Clamp the shaft in a vise or fasten it securely to the workbench in any manner you choose, and put an alcohol lamp under the counterhole so that the flame goes inside of the hole. When the shaft is heated, dip the strip of wood in water for a moment and then slowly draw it over the polished surface of the hot shaft, as shown in the drawing, until the desired curvature is obtained. Wood bent in this way will hold the curve permanently, although it can be taken out again by the same process.—Emmett Marshall, Seattle, Washington.

Painting Boat Bottoms

Most boats are kept in water where either weeds, barnacles or worms will attack the wood. For this reason copper paint is used below the waterline and has the tendency to prevent destruction by either or all of these parasites. Two or three good coats should be applied. Copper paint does not dry quite hard, so you need not hesitate to launch your boat even if the bottom surface does feel slightly tacky after 24 hours. Use a cheap brush in applying the paint but never use it for any other purpose. Small racing boats are often especially prepared by painting the bottoms with melted tallow or a mixture of graphite and oil. This gives a slick surface which repels water and reduces the friction, thus adding speed. Even vaseline may be used in emergency cases. These lubricants are applied over the regularly painted bottom and should, of course, be cleaned off after the race to prevent soiling other boats coming in contact with them.

Self-Tightening Chain Sling

It is often necessary to erect a chain block in various positions in a shop for temporary work. Sometimes a bar is thrown across two beams and the block is suspended from this, or the chain is simply wrapped around one beam. In the first case the bar may slide out of position with disastrous results, and in the second, the chain may slide on a diagonal pull, unless care is taken to wrap it well. To avoid both of these hazards, a support can be made that tightens itself under load and is consequently rigid and safe. Use 1½ by ⅝-in. bar stock. Three



A Chain-Sling Support Which Tightens Itself on Any Beams within Its Capacity

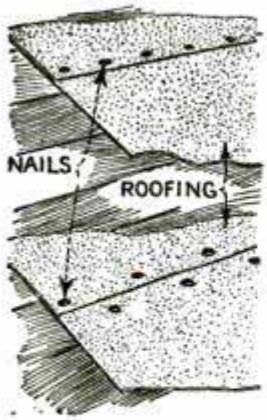
lengths are needed, one solid piece, bent over at each end, and two pieces, half as long as the solid one. These are bent over at the outer ends only, and the inner ends are slotted and drilled for a pin, then hinged to the first piece by means of a cross pin. The pull of the chain tightens the device.—Harry Moore, Hamilton, Can.

Determining If Armature Shaft Is Bent

The armature shaft of the Ford starting motor often becomes bent from a severe backfire when starting. This causes the spring or setscrew to strike inside of the Bendix cover, and the motor turns so rapidly with the Bendix removed that the eye cannot be trusted to determine whether or not the shaft is straight. A good method of determining this is to hold a nail or a sharp-pointed punch in the center mark at the end of the armature shaft. The motor is then started and stopped several times by pressing and releasing the switch. As the motor starts and stops, a severe vibration can be felt in the nail or punch if the armature shaft is not straight.—E. T. Gunderson, Jr., Humboldt, Iowa.

How to Nail Roofing Paper

Roofing paper is usually applied as shown in the upper detail. This method is not entirely satisfactory, as the paper contracts and expands, which in course of time will pull the nails loose or enlarge the nail holes, permitting leakage. To prevent this, drive the nails in a zigzag manner, as indicated in the lower detail. The edge of the paper may then buckle to some extent but will not leak.



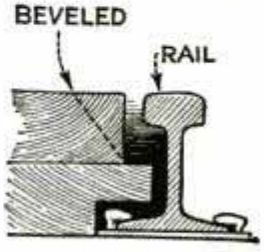
Removable Feed Box

"Stationary feed boxes, generally used in horse barns, are decidedly unsanitary and cause many diseases," says a veteran horseman. Removal of the trash from the box is not sufficient, but a thorough cleaning and airing in the sunlight is essential. Accordingly, the feed boxes must be made so that they can readily be removed, yet securely held in place while in use. A good arrangement is shown in the drawing. In this case, two 1 by 6-in. boards, 12 in. long, were nailed to two opposite sides of the box to project underneath. Two 12-in. lengths of flat iron were bent to the shape shown and fastened to the sides of the manger, providing slots into which the extending boards on the box could be inserted. Thus the box was held securely, yet was easily removable.

Removable Feed Box on Manger Facilitates Cleaning and Airing

Safeguard for Railroad Crossings

Many serious accidents have occurred to people getting their feet caught between the planking and the rail at railroad crossings. A method of reducing this danger is shown in the drawing. It is very simply contrived, the edge of the plank adjacent to the rail being merely beveled. This affords plenty of clearance for the flanges of the car wheels and at the same time makes it easy for a person to pull his foot out, in case it is accidentally caught.—F. N. Hollingsworth, Boston, Mass.



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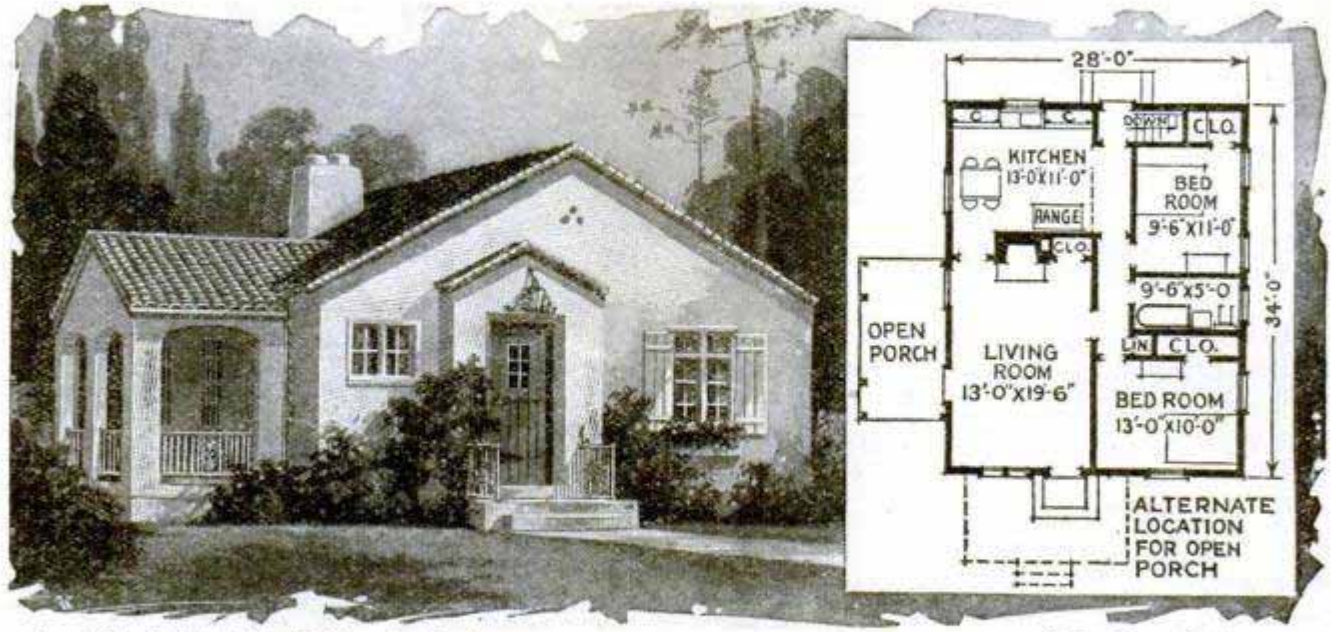
Is This Your Home?



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Plan No. 4A35

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THIS is a vivid type of house, with a romantic history, and, though naturally more suited to warm climates, it is found in artistic settings throughout the northeast and northwest. The walls are a cool shade of stucco—white, gray or with just a suggestion of pink. The tiles of the roof are variegated reds, and the iron work of the porch and entrance may be either black or verde.

This Spanish bungalow should be of special interest to younger people getting started in life, or to older folks who have given up the larger house and want less room. It is a home for a small family. It provides nearly every comfort and convenience demanded by the modern housewife. Among its many advantages are those of reasonable building costs and adaptability to a narrow lot.

At the side is an open porch of generous dimensions, restful and inviting. This porch is a particular advantage, for its convenience to the kitchen permits its use as an outdoor dining room. On cooler days, the table may be set either before the open fire in the living room or in a bright corner of the kitchen.

Consider the vista. When you enter this house from the end, the whole living room lies before you. At the far end is the fireplace, beyond it a glimpse of the sunny dining corner, and through the door at the left you look out upon the open porch. There is a full basement beneath the house.

Home Builders' Questions

Q. Can you build a fireplace in the second story if there is not one below? A. Not if the floors are of frame construction. In all types of frame buildings chimney stacks should start from the basement.

Q. Is there any quick way to find out exactly how much a house will cost? A. There is no quick way. The approximate price is sometimes found by learning the cubic contents of the house and using this with the prevailing cost per cubic foot that applies in the locality. For small houses this is an unsatisfactory method, though a very close figure may sometimes be computed for larger buildings, such as schools, warehouses, etc. The only way to get an exact figure on the cost of the small house is to have a contractor make an estimate based on the working drawings and specifications.

Q. Our roof leaks. We have held out money from the contractor until he fixes it. Can I force him to make the necessary repairs? A. Your contractor will repair your roof. You are justified in holding out on him until he does.

The finest tool of its kind

Try This Test

Put Auger Bit into chuck of "Yankee" Brace. Bore deep into tough wood. Then pull upward with all your strength. Bit will not come out of chuck.

Price (10-inch sweep) $8.20

Guaranteed by the name "YANKEE"

SEE this wonderful "Yankee" Ratchet Brace at your hardware dealer's. Like all "Yankee" Tools it saves time and labor. Try it and you will appreciate the economy of paying a little more to own the finest tool of its kind.

For No. 2100 is made and finished like a precision tool. The famous "Yankee" Ratchet is smooth, powerful, silent; as smooth-working as the stem-wind of a watch—yet unbreakable. No need to hold chuck to keep it from turning back on ratchet movement.

A finger touch on easy-acting Ratchet Shifter gives right or left ratchet, or rigid. Positive visible adjustment. Dustproof. Moisture-proof.

New "Yankee" Chuck—most efficient ever made. Ball-bearing, quick centering, and accurate. Holds any bit (round, square, any taper) in vise-like grip. Yet chuck releases bit at a turn of wrist.

Handles are hard rubber and indestructible. Top handle, steel clad, ball-bearing. Sweep handle caps held by patented "Yankee" method, preventing excessive handle play. Brace is finished beautifully in keeping with its perfect mechanism.

"Yankee" Bit Extension No. 2150

Price (18-inch) $2.30

Stands abuse and follows through. Bit held by socket. No jaws to break. No loosening and pulling out of bit in work. And bit in "Yankee" Socket can't jam. Fits any brace. Lengths: 15, 18, 21, 24 inches. Holds large range of bit shanks.

Write for FREE "Yankee" Tool Book

Shows how "Yankee" Tools make work easier: Spiral Screw-drivers, Plain Screw-drivers, Ratchet Bit Braces, Automatic Push Drills, Automatic Feed Bench Drills, Ratchet Tap Wrenches, Vises with removable base, etc.

Dealers Everywhere Sell "Yankee" Tools

"Yankee" on the tool you buy means the utmost in quality, efficiency and durability

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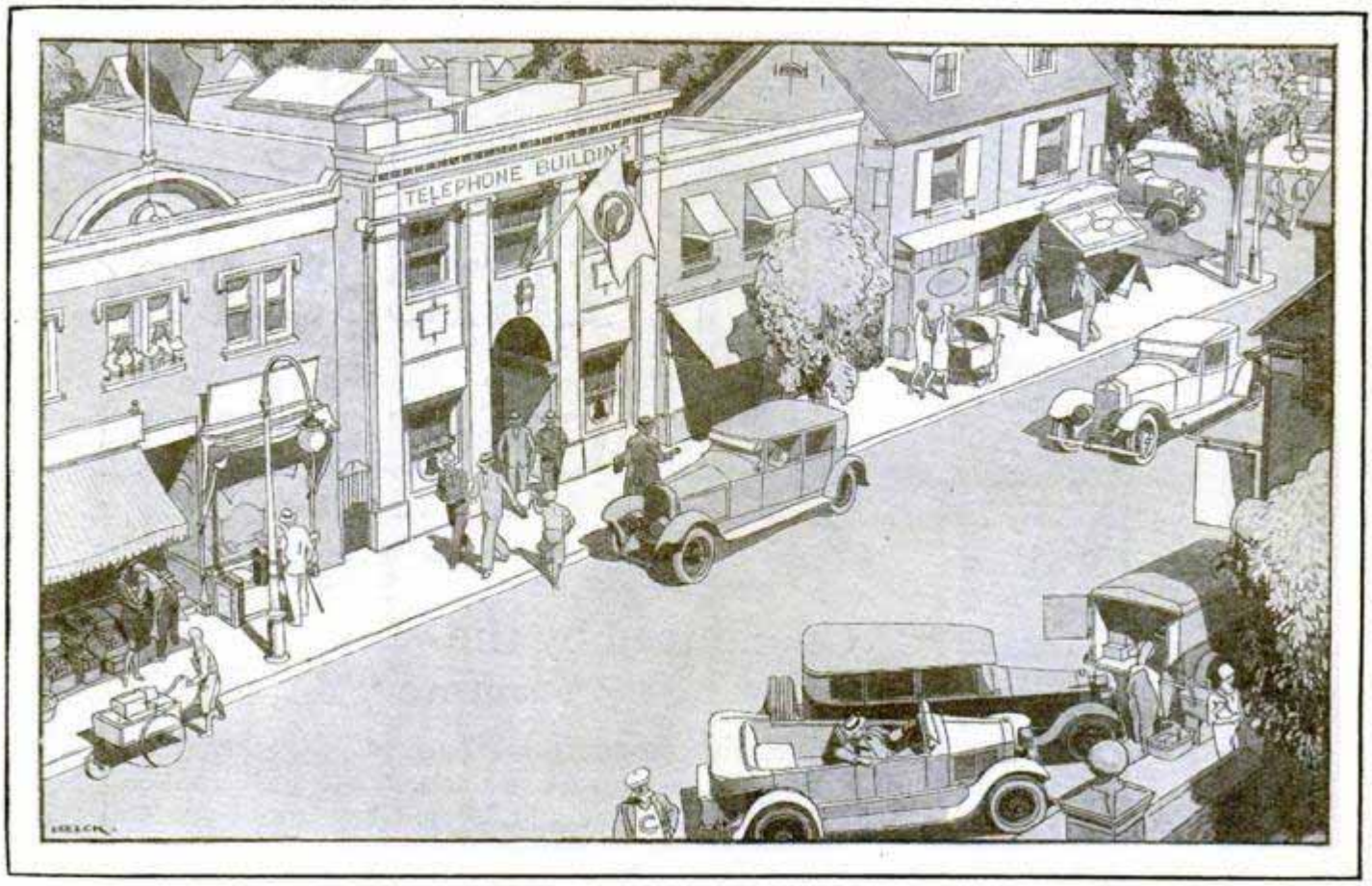

A home town enterprise backed by national experience

An Advertisement of the American Telephone and Telegraph Company

THE Bell System is a home town enterprise in operation so that each community may have service that suits its needs. It is a national enterprise in research, engineering and manufacture so that every telephone user may have the best that concentration and quantity production can achieve.

There are twenty-four operating companies devoting their energies to telephone problems throughout the United States—for example, the Northwestern Bell Telephone Company operating throughout Iowa, Minnesota, Nebraska, North Dakota and South Dakota. It has 11,000 men and women—friends and neighbors of the other people in their towns—working to maintain in its territory the best standards in telephony now known.

In New York, in the American Telephone and Telegraph Company and the Bell Laboratories, are 5000 persons, including scientists, engineers and consultants in management, engaged in inventing better apparatus and discovering better ways to do things.

The Northwestern Company with its 11,000 employees has the use of all that this group of 5000 in New York discover and perfect. Likewise the other twenty-three operating companies. They are regional organizations adapted to local conditions, but behind every telephone in city or hamlet is the national organization for the development of the telephone art.

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RACING car drivers *can't* take a chance with their engines.

Before a race they test their cars with the best gasoline obtainable. Then they add "Ethyl" fluid—the anti-knock compound—to develop the last ounce of power for speed and safety.

Similarly, leading oil companies are adding "Ethyl" fluid to the gasoline produced for the general motoring public, so that your car too may increase its performance under all driving conditions.

This fuel is called Ethyl Gasoline and is sold at pumps which display the emblem shown below.

Read the facts about Ethyl Gasoline given below. Remember that even the best gasolines become better when "Ethyl" fluid is added.

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What Ethyl Gasoline is

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It is formed by adding Ethyl brand of anti-knock compound ("Ethyl" fluid) to selected motor gasoline in an amount sufficient to utilize the higher compression created by carbon deposits or advanced engine design.

"Ethyl" fluid is a concentrated liquid containing tetraethyl lead which has the property of controlling the combustion rate of gasoline. It is a patented product.

Ethyl Gasoline is colored red for identification. The color has nothing whatever to do with its performance. It takes more than dye to make "anti-knock" gasoline.

Ethyl Gasoline is sold only at pumps which display the "Ethyl" trademark.

Ethyl Gasoline is the yardstick by which other gasolines are measured.

ETHYL GASOLINE

ETHYL
BRAND OF
ANTI-KNOCK
COMPOUND
ETHYL GASOLINE
CORPORATION
Knocks out that knock

What Ethyl Gasoline does

If your car is designed to operate on ordinary gasoline, the use of Ethyl Gasoline will:

Eliminate "that knock" and power loss.

Make carbon deposits a source of extra power. For carbon increases compression and Ethyl Gasoline is the high compression fuel.

Give a smoother and better pulling engine.

Reduce gear-shifting and increase acceleration, thereby making traffic driving easier.

Cut down vibration, thereby reducing engine wear and tear and depreciation.

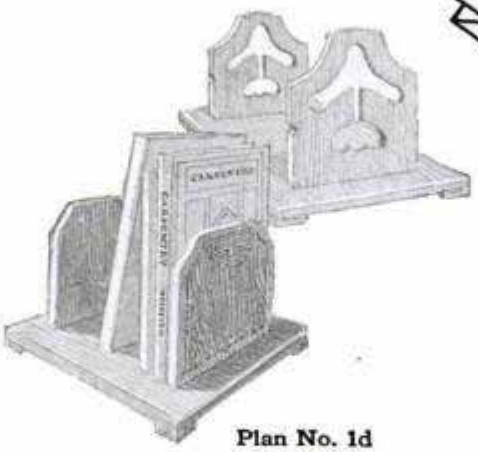
Save you the expense of carbon removal and other repairs caused by "knocking" and carbon formation.

Give more power per gallon for your fuel bills—and more mileage as compression is increased by carbon deposits.

If your car is a high compression car, just remember that Ethyl made it possible and is necessary to obtain maximum performance.

MAKE THEM YOURSELF

Plan No. 18d



Plan No. 1d

Plan No. 4d

For hands that are "All Thumbs"

Stanley Plans make woodworking easy

Nothing compares with the satisfaction and pleasure you will get from making articles like these with your own hands and your own tools. With Stanley Plans to work from, the job is easy and inexpensive.

There are 25 different Stanley Plans. The list is shown in the centre of this page. Each plan tells you just how to make the object, covering every step—how to select and cut the wood, how to assemble the job, how to sandpaper, paint and finish it. To do your best work you need good tools—of course! Practically every carpenter uses Stanley Tools. Manual Training classes, too. Stanley makes the most complete line.

Buy your Stanley Plans from your hardware dealer. If he cannot supply you, write to us. Send 10c for each plan and ask for a free catalog of Stanley Tools. Address The Stanley Works, New Britain, Conn.

No.
1d—Book Rack
2d—Candle Stick
3d—Pipe Rack
4d—Flower Box
5d—Table Lamp
6d—Toy Automobile
7d—Sconce
8d—Dinner Gong
9d—Bird Houses
10d—Dog House
11d—Book Stand
12d—Smoking Cabinet
13d—Kitchen Cabinet
14d—Sewing Cabinet
15d—Cedar Chest
16d—End Table
17d—Tea Wagon
18d—Model Sailboat
19d—Combination Sail- and Row-boat
20d—Combination Kitchen Seat and Step Ladder
21d—Garden Seat
22d—Garden Trellises
70d—Small Tool Chest
71d—Large Tool Chest
72d—Work Bench

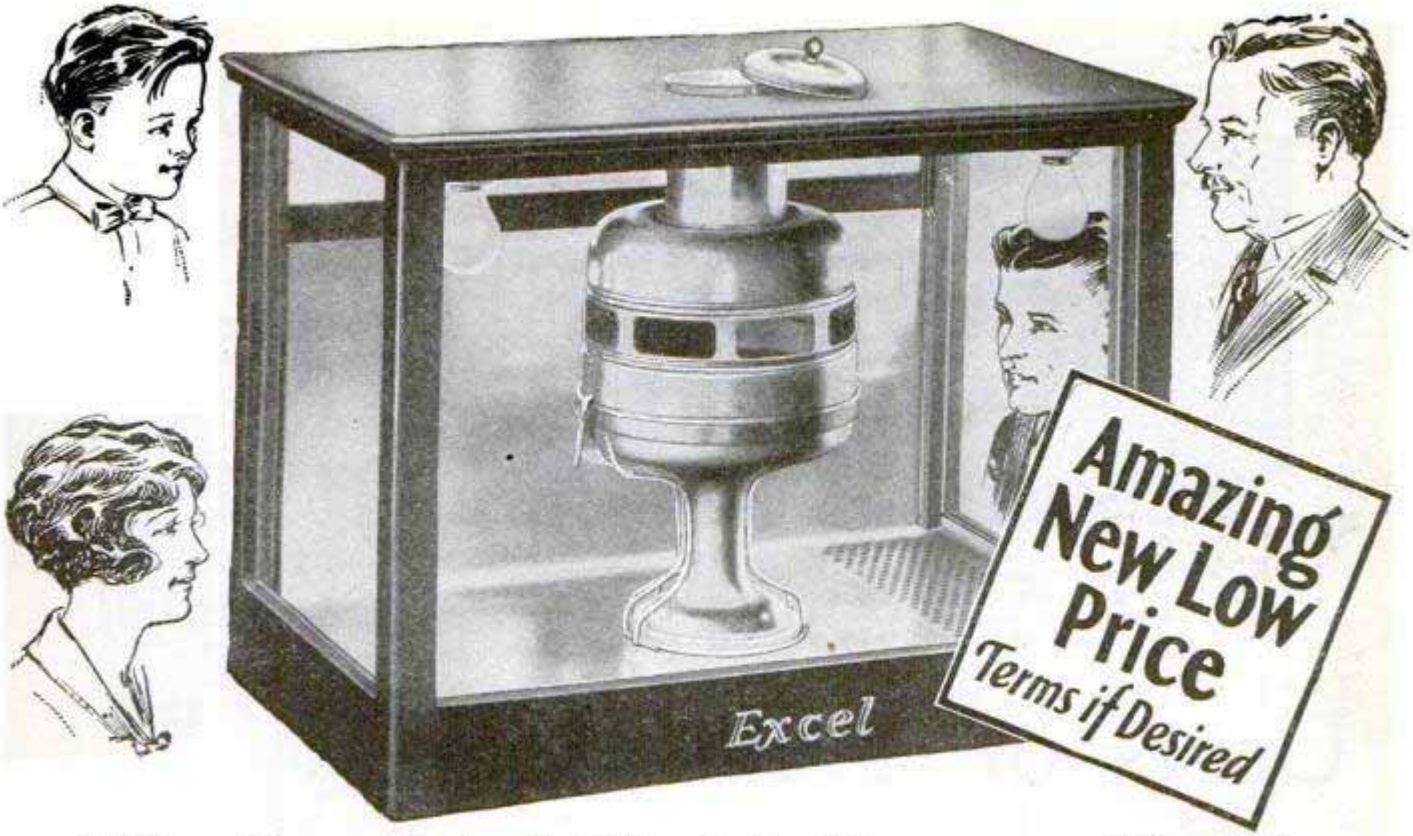
This book, "How to work with tools and wood," takes all the mystery out of wood working. Tells how to make useful objects, do odd jobs, and care for tools.
185 pages
150 illustrations
cloth binding
At your dealer's or direct, $1.00.

The best tools are the cheapest to use

Ask your hardware dealer

STANLEY TOOLS

The choice of most carpenters



New Low Priced Electric Pop-corn Machine

Creates Amazing Opportunity for $200 to $1000 Monthly Profits!

DEALERS!

Excel will make your waste space pay big profits. Nine out of ten customers buy pop-corn elsewhere — why don't you get these extra sales? Let us show you how other dealers are making these easy profits.

SALESMEN!

Drop everything—here's your proposition. A few sales a week can net you $100.00. Sell drug stores, cigar stores, barbecue stands, etc.—market unlimited! No experience needed—we give you exact method that assures steady $20.00 days. Territories going fast.

SPARE-TIME WORKERS!

Men and women — get into this great pop-corn business and make $50 to $200 a week. We show you complete plan that answers every question. Small payment down starts you. Learn about it. Mail coupon now.

MAN, do you realize the money that is being made in the pop-corn business today? MILLIONS OF DOLLARS! Stand near any pop-corn stand. Watch people handing dimes to the dealer as fast as he can hand out bags! At a good location 50, 100, 200, 500 sales in a few hours—$5 to $50 cash—AND 75% OF IT IS CLEAR PROFIT! And now a sudden new opportunity to cut yourself a big slice of these easy profits is dropped into your lap!

Why is it that only a small percentage of stores (in comparison to the demand) sell pop-corn? Simply because the big majority of dealers have never been approached. They never realize the long profit, big sales and fast turnover on pop-corn. And, then again, many have balked at paying $300 to $1,000 for a pop-corn machine.

But now this last remaining obstacle to big profits is swept away! Here's a beautiful, efficient, modern electric corn popping machine at a price less than the down payment on many other machines of the same efficiency! So amazingly low that it often pays for itself the first week. And sold on easy payments if desired.

A New Invention

Make no mistake. Don't think that because the price is so low that this machine has any cheap construction or weak parts to get out of order quickly. It is designed and sold by The Excel Electric Company, originators and largest manufacturers of domestic (electric) corn poppers, sold all over the United States. This low price could only be made by such an organization as this nationally advertised concern, whose production facilities can turn out a huge volume of these machines at low manufacturing cost!

Excel is guaranteed for one year! Heating element is of genuine Nichrome. Beautifully finished in decorated mahogany, plate glass, and nickel plated metal. Popper itself is genuine aluminum. **Easy to operate.** Just shove the plug into any socket and pop 80 10c bags in less than an hour! When you see and examine this beautiful machine, you'll wonder how such a value is possible! Sold on cash or easy terms.

Dealers—salesmen—men and women who want to get into the pop-corn business in full or spare time . . . MAIL THIS COUPON. We have a complete money-making plan for each of you that answers every question and explains everything fully. Absolutely no obligation. But act quickly. You can't lose. Tear this coupon out and mail to The Excel Electric Co., Commercial Corn Popper Division, Dept. G-16, Muncie, Indiana.

RUSH COUPON FOR DETAILS

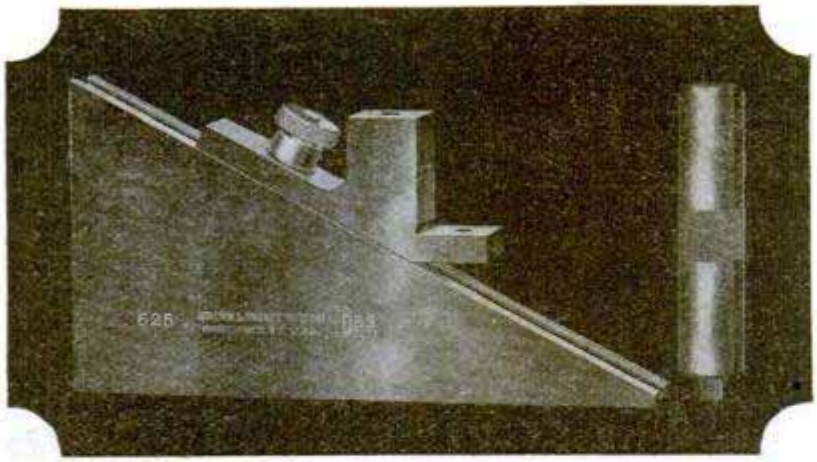
The Excel Electric Co.,
Commercial Corn Popper Division,
Dept. G-16, Muncie, Indiana.

Yes, rush me full information regarding your money-making plan. I am interested because
( ) I am a dealer ( ) I am a salesman
( ) I want to start up a pop-corn stand.
(Check the reason you are interested.)

Name .....

Address .....

City ..... State .....



Planer and Shaper Gauge No. 625 saves time in adjusting the cutting tool. The design of the gauge makes it easy to set to a micrometer and permits a tool setting from ¼" to 8½" with only one extension.

Users of Tools Are Good Judges of Value

Men who use precision tools have the mechanical training that enables them to judge mechanics' tools fairly.

They appreciate that fine finish, clean cut graduations, and good design indicate tools of high quality. They *know* that accuracy and reliability can come only from the most exacting standards of workmanship. That's why mechanics everywhere respect Brown & Sharpe Tools so highly when they judge tool values.

Ask your dealer for Small Tool Catalog No. 30 listing over 5,000 items. If he cannot supply you, write us direct. Dept P. M., Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE TOOLS

* COMBINATION SET
No. 438

* MICROMETER CALIPER
No. 8

* UNIVERSAL SURFACE GAUGE
No. 620

* SCREW PITCH GAUGE
No. 630

* VERNIER CALIPER
No. 570

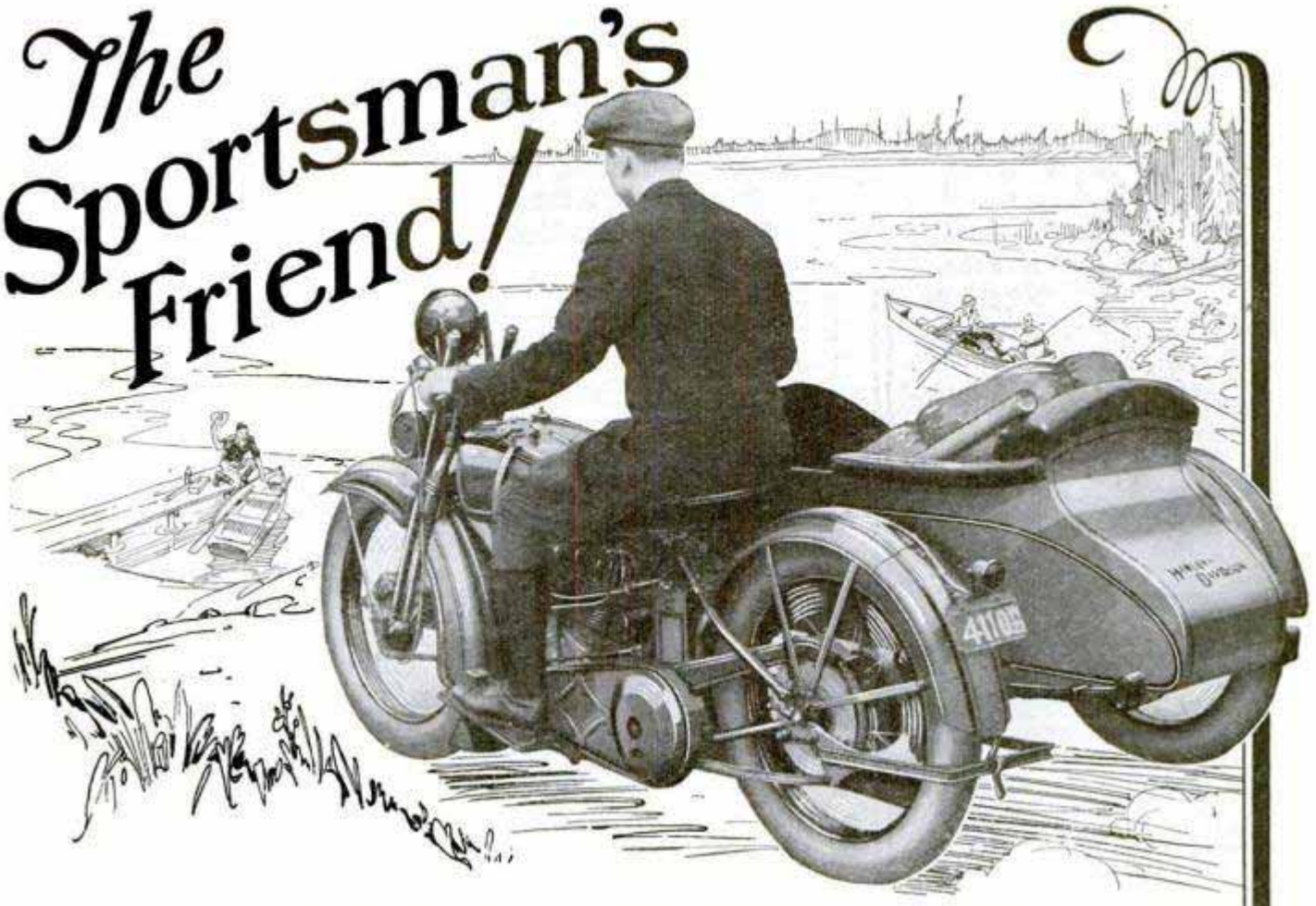
* TOOLMAKERS' BUTTONS
No. 758

* MICROMETER CALIPER
No. 55

* *For description of this tool see Catalog No. 30*

B·S "WORLD'S STANDARD OF ACCURACY"

The Sportsman's Friend!



THOUSANDS of trail-wise, pleasure-bent sportsmen ride the Harley-Davidson Twin—because it fits their needs, fits their pocketbooks, and multiplies their sport. Join them this year! Crowd your after-work hours and vacation days with happy, carefree sport. You'll thrill to the Harley-Davidson's power. You'll admire its low cost of operation—*2¢ per mile pays for everything!*

You can buy a Twin for $310 f. o. b. factory, on easy Pay-As-You-Ride terms. Ask your dealer.

Mail the coupon for our latest catalog.

HARLEY-DAVIDSON MOTOR CO.
DEPARTMENT P MILWAUKEE, WIS.

The Single—the famous solo mount that travels "80 miles per gallon," and is priced at only $235 f. o. b. factory. All models have both front and rear-wheel brakes and complete electrical equipment.

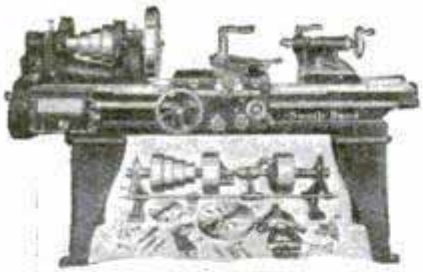
HARLEY-DAVIDSON Motorcycles

HARLEY-DAVIDSON MOTOR CO.
Dept. P., Milwaukee, Wis.

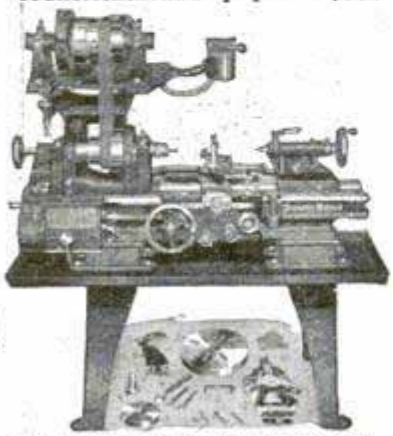
Interested in ☐ Twin ☐ Single
☐ Interested in selling motorcycles.

Name.....
Address.....
City.....State.....

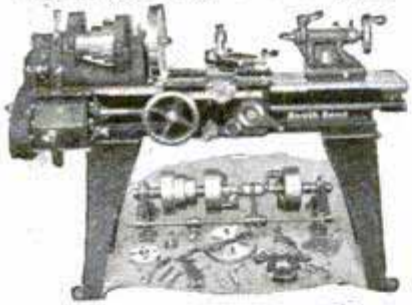
Mail this Coupon



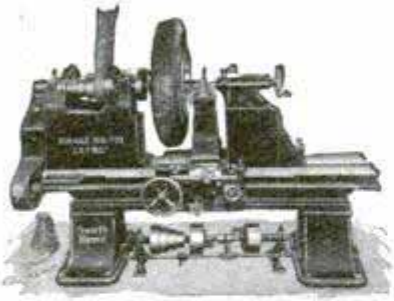
16 inch—Weight 2035 lbs.
Quick Change Back Geared Screw Cutting Lathe, 8 foot Bed. With countershaft and equipment **$570**



13 inch—Weight 1460 lbs.
Tool Room Quick Change Back Geared Screw Cutting Lathe, 4 ft. Bed. With motor and electrical equipment. Price - - - **$525**



11 inch—Weight 675 lbs.
Quick Change Back Geared Screw Cutting Lathe, 3 foot Bed. With countershaft and equipment **$325**



New Brake Drum Lathe
Handles all Brake Drum work without removing tire or rim. No. 1 for wheels up to 33" diameter, complete with countershaft and equipment, weight 1225 lbs. Price - - - - - **$425**

South Bend Lathes

New Model Back Geared Screw Cutting Lathes

for the

Manufacturing Plant
Machine Shop
Service Station

Electrical Shop
Laboratory and
Engineering Shop

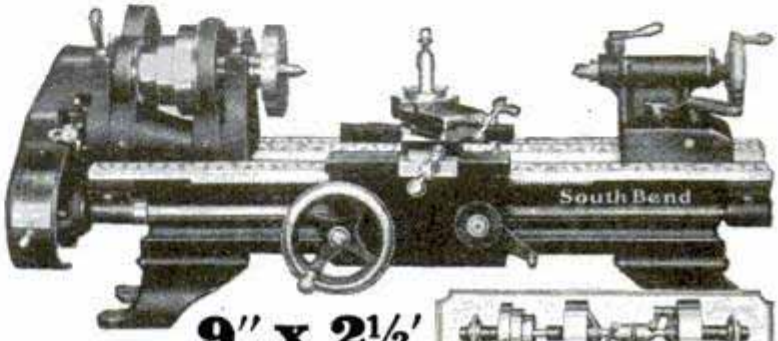
Write for Catalog No. 89A showing complete line of new Model South Bend Lathes ranging from 9 in. to 24 in. swing and from 2½ to 16 ft. beds—with countershaft or choice of 3 types of electric drives, all at surprisingly low prices.

Precision 64 accuracy tests with precision instruments applied in the manufacture of each South Bend Lathe insure its accuracy.

Speed Simplest adjustment and absence of all unnecessary parts enable the operator to work at highest efficiency.

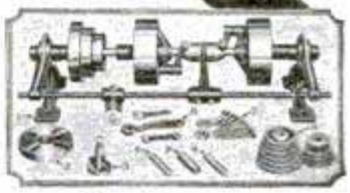
Durability South Bend Lathes are sturdily built of most durable materials.

Weight 375 Pounds



9" x 2½' Junior Back Geared Screw Cutting

Complete with Countershaft and Equipment $150



Built in the same plant where 40,000 other fine Precision Lathes have been manufactured for the United States Government, Ford, Westinghouse, Bethlehem Steel Co., U. S. Steel Corporation, and hundreds of other large industries in the United States and 78 Foreign Countries. It is the world's largest Lathe value.

Features

- **—Power Feed to Carriage**
- **—Set-over for Taper Turning**
- **—Hole through spindle ¾ in.**
- **—11" Between Centers**
- **—Cuts threads 4 to 40 per in.**
- **—Maximum draw-in Collet size ½ in.**

Easy Payments if Desired

A small down payment brings you the Lathe to use while you are paying for it. In this way it earns its own cost by the work it does and the savings it makes.

FREE—Write for No. 89A Catalog and New Booklets

Check off in the squares below, indicating the Lathes in which you are interested —cut out and mail to us. Special booklets and Catalog No. 89A showing 216 Sizes and Types of New Model Lathes mailed free postpaid on request.

- ☐ **9 in. Junior Booklet 22k**
- ☐ **9 in. Lathe Booklet**
- ☐ **11 in. Lathe Booklet**
- ☐ **13 in. Lathe Booklet**
- ☐ **15 in. Lathe Booklet**
- ☐ **16 in. Lathe Booklet**
- ☐ **18 in. Lathe Booklet**
- ☐ **General Catalog No. 89A**
- ☐ **"How to Run a Lathe" price 25c, postpaid**
- ☐ **New Brake Drum Lathe Circular**

South Bend Lathe Works : 638 E. Madison Street, South Bend, Indiana, U. S. A.

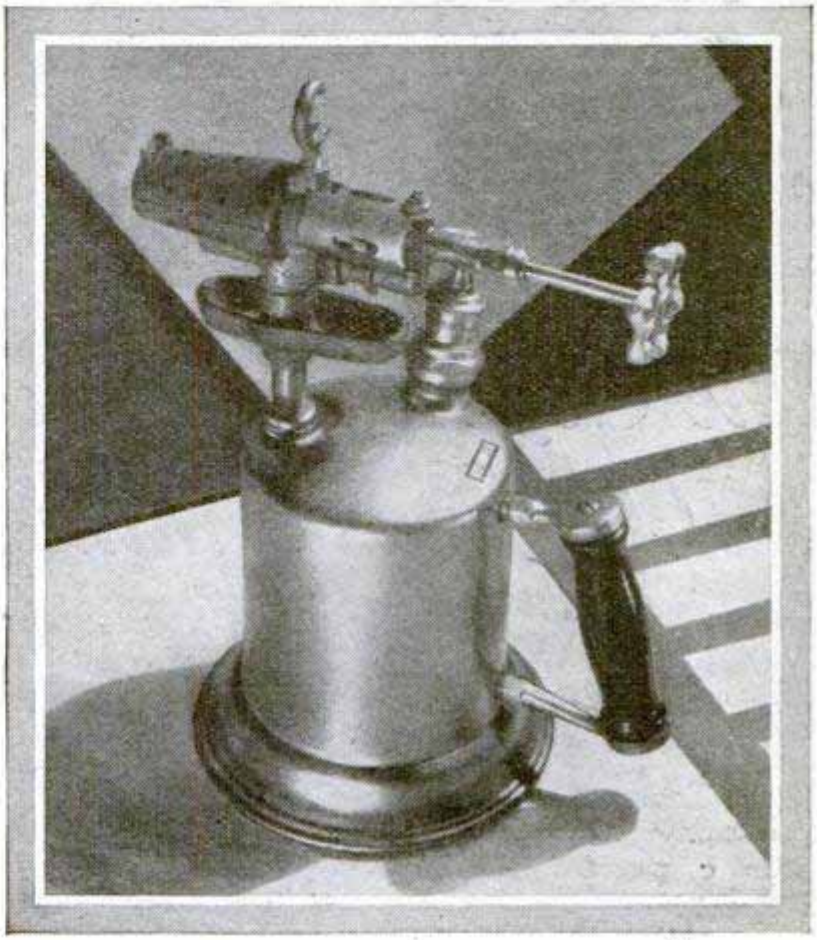
New York City Salesroom: 183 Centre Street

Carried in Stock by Machinery Supply Dealers in Principal Cities Throughout the World

ATLANTA, GA.—Fulton Supply Co., 70 Nelson St.
BALTIMORE, MD. — Carey Mach. & Supply Co., 119 E. Lombard St.
BIRMINGHAM, ALA.—Moore-Handley Hdwe Co., 21st & Ave. "A"
BOSTON, MASS.—Joseph Beal & Co., 465-71 Atlantic Ave.
CHICAGO, ILL.—Scott Ransbach Mach. Co., 130 S. Clinton St.
CINCINNATI, OHIO—The E. A. Kinsey Co., 335 Fourth St., W.
CLEVELAND, OHIO—Clark Machinery Co., 1235-45 St. Clair Ave.
DALLAS, TEX.—Huey & Philp Hardware Co., 1029 Elm St.
DENVER, COL. — Hendrie & Bolthoff Supply Co., 1621 17th St.
DETROIT, MICH.—Lee Machinery Co., 3171 Bellevue Ave.
HOUSTON, TEX.—Brazelton-Wessendorff & Nelms, 317 Preston Av.
KANSAS CITY, MO.,—H. J. Brunner Mach. Sup. Co., 1512 Grand Av.
LOS ANGELES, CALIF.—Eccles & Davies Mach. Co., 320 San Pedro St.
MILWAUKEE, WISC.—Western Iron Stores Co., 145 W. Water St.
NEW ORLEANS, LA.—Oliver H. VanHorn Co. Inc., 522-534 Camp St.
NEW YORK CITY, N.Y.—J. E. Beggs Co., 183 Centre Street
OMAHA, NEB.—Interstate Mach. & Supply Co., 1006-10 Douglas St.
PHILADELPHIA, PENN. — Delta Equipment Co., 148 N. Third St.
PITTSBURGH, PENN. — Somers, Fitler & Todd Co., 329 Water St.
PORTLAND, ORE.—The Portland Machinery Co., 62-4-6 First St.
PROVIDENCE, R.I.—The E. A. Eddy Mach. Co., Eddy & Clifford Sts.
ST. LOUIS, MO.—Blackman-Hill & Co., Inc., 1513 N. Broadway
ST. PAUL, MINN.—Robinson-Cary & Sands Co., 4th & Wacouta Sts.
SAN FRANCISCO, CALIF.—C. F. Bulotti Mach. Co., 829 Folsom St.
SEATTLE, WASH. — Perine Machinery Co., Inc., 209 First Ave., S.
TOLEDO, OHIO—The Kirkby Mach. & Supply Co., 20-22 St. Clair St.
MONTREAL, QUE.—Can. Fairbanks-Morse Co., 84 St. Antoine St.
TORONTO, ONT.—A. R. Williams Machinery Co., 66 Front St., W.

C & L 32

This is one of the most popular blow-torches we have ever made. It is designed for the man who uses a blow-torch in his daily business and demands not only excellent performance but rugged ability to stand rough handling. 32 contains the most advanced, patented C & L improvements. It has a red handle. Sure sign of satisfaction.



We've put a *red handle* on it to be sure you get Clayton & Lambert

NEXT time you're in a hardware store or electrical shop, if you happen to look over the line-up of blow-torches you'll see some with *red handles.* They're Clayton & Lambert torches. We put the red handle on so you could tell at a glance that you were getting the best value you can buy in a blow-torch.

The red handle doesn't make it work any better. The insides you can't see do that. But the red handle tells you the insides are right.

It's too bad you can't see what a lot of improvements we've made in blow-torches. Improvements that make them burn hotter, burn longer, and last longer too. But they're there, all right. And they give such definitely better service that users have made Clayton & Lambert the largest selling blow-torch in the world.

Here's an example. The little hole the gas comes out of must be fifteen-thousandths of an inch in diameter. If you spread that hole you might as well throw the torch away, for it won't work satisfactorily. Clayton & Lambert devised a way to make sure that hole couldn't be spread, but at the same time whenever you close the hole you clean the carbon out of it so it can't clog. That's just one of the many Clayton & Lambert patents.

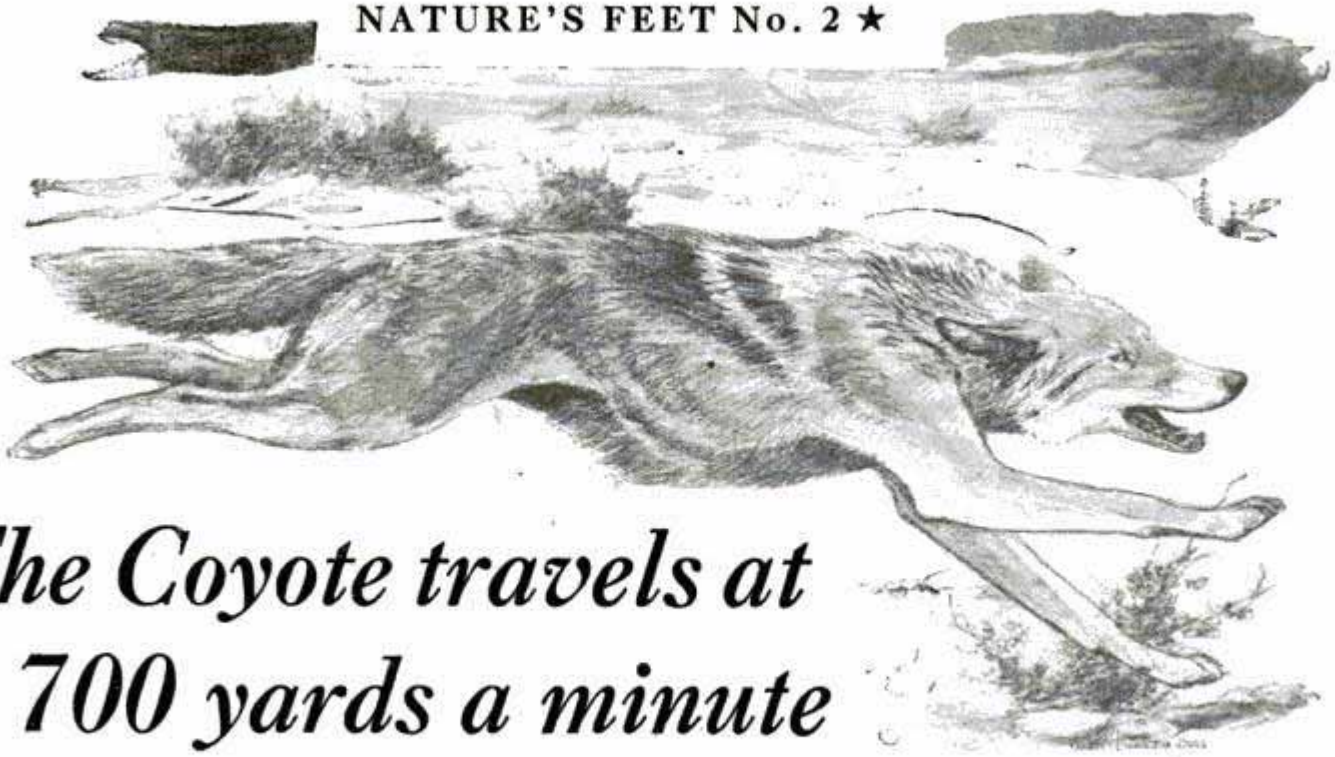
So when you need a blow-torch—and if you'd just think about it a minute you'll be surprised how often you do, for scraping paint, or fixing up the radio, or any number of jobs around the house—look for the blow-torch with the red handle, in the hardware or electrical store. Your money can't buy better.

CLAYTON & LAMBERT

MANUFACTURING CO.

DETROIT, MICHIGAN

NATURE'S FEET No. 2 ★



The Coyote travels at 700 yards a minute

THE coyote of the Western plains is one of the swiftest of American animals. He has to be fast in order to eat. For the other beasts of the prairies that he must catch for his meals are likewise swift runners.

Read Trapper Evans' account of his unusual experience with a coyote:

"One morning I was out hunting geese with my brother. We had placed the decoys around us and were sitting waiting for the geese to arrive. They did not come, but off in the distance we heard a coyote howl. As day commenced to break we noticed the coyote sitting on a nearby hill about half a mile away. I thought I would have some fun So, picking up one of the decoys which had a bullet hole through it, my gun in hand, I crawled through the grass, holding the decoy just above the top of the grass. I had gone about 50 yards when I looked back and noticed my brother waving me to lie down. I lay down quickly and looking through the hole in the decoy beheld a strange sight. The coyote, thinking that one of the geese had strayed from the flock, was crawling slowly towards me, every once in a while rising to look at his supposed prey. I lay perfectly still and waited until he approached within 50 feet, and then rising quickly I shot him before he had recovered from his surprise.

"The coyote's feet are very much like the wolf's, only smaller. He is a cunning fellow and very swift."

Trapper Evans

KEDS special models for boys give your feet much of the springiness of the coyote's paws. Keds soles are tough and springy. They grip surely on ground or floor. The uppers are light, yet strong. And the special Feltex innersole keeps your feet comfortable.

Ask for Keds by name. *But be sure the name "Keds" is on the shoes you buy.* That name is your guarantee of getting the best dollar for dollar value in rubber soled footwear.

Write for our free booklet containing all kinds of information on games, sports, camping, vacation suggestions and other interesting subjects. Dept. 2270, 1790 Broadway, New York City.

United States Rubber Company

To American Boys

An Offer of the Actual Footprints of the Coyote

By special arrangement with Trapper Evans the makers of Keds are now able to offer you the actual tracks of many American wild animals. Each one is an original, identical footprint—hardened in claylike material, mounted on felt. Write to Trapper Evans, care of Keds Outdoor Department 2270, 1790 Broadway, New York City, enclosing 35c, and obtain a track of the coyote sent postpaid in U. S. and Canada.

A complete list with prices of the wild animal tracks made by Trapper Evans will be mailed free on application.

"THE GLADIATOR"
This popular Keds model for all around use has a distinctive non-skid sole. In brown, white or gray.

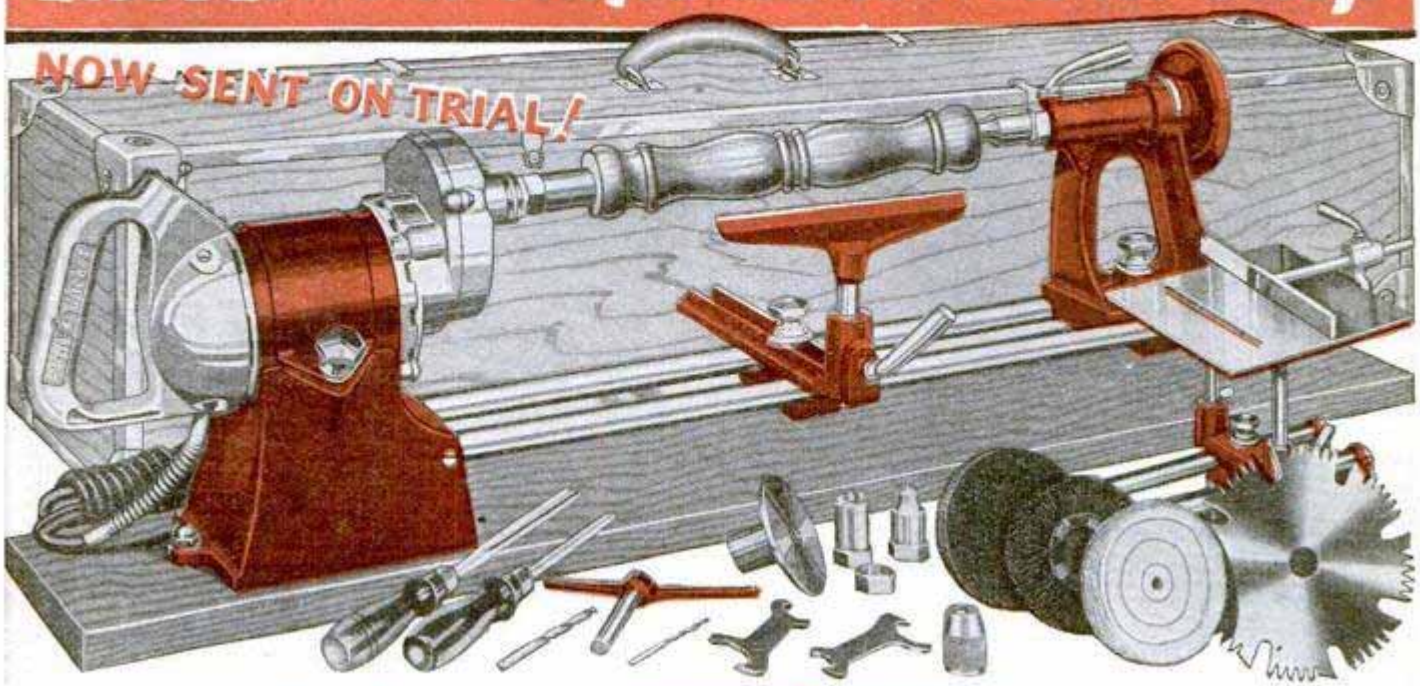
★ This account of the coyote by Trapper Evans is the second of a series of his experiences with wild animals of America printed for the first time by the makers of Keds.

They are not **Keds**

unless the name *Keds is on the shoe*

Copyright, 1928, by United States Rubber Company

The Modern Craftsman's Wonder Shop

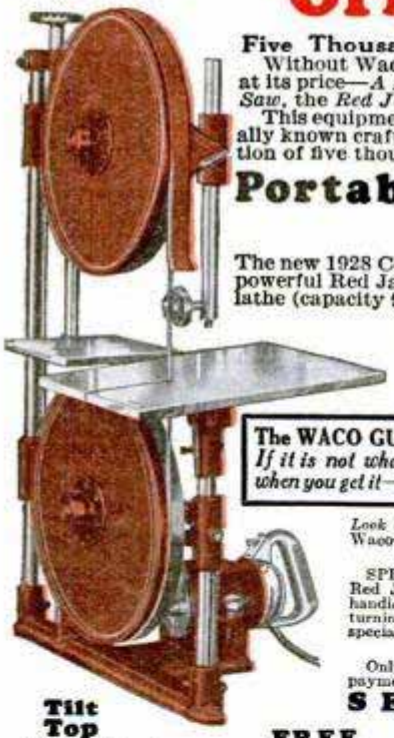


Original Red Jacket Assembly

Five Thousand Red Jacket Craftsmen have made a bargain possible for you

Without Waco sales volume, no manufacturer could give the equivalent of "*Waco Shop No. 12*" at its price—*A Red Jacket Master Drill*, the *Waco Craftsman's Lathe*, the *electric power tools*, the *Jig Saw*, the *Red Jacket Band Saw*, or the Crafts Courses.

This equipment was designed, tested, approved and is guaranteed by Wm. L. Aylward, a nationally known craftsman and manufacturer, who has developed his hobby into a co-operative association of five thousand craftsmen.



Portable—Interchangeable—Complete HOME WORK SHOP

The new 1928 Combination of Electric tools brings you a Red Jacket Band Saw and in addition the powerful Red Jacket Master Drill Motor with direct drive to the Waco Craftsman's wood turning lathe (capacity 9 in. x 38 in.); a bench saw that has depth and side gauges, scroll and jig saw; and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to any light socket and converts your work bench into a complete private tool and machine shop.

It is a complete chest full of electrically driven tools designed by a master for the private use of tool lovers and men who create, repair and appreciate handy tools at home.

The WACO GUARANTEE
If it is not what you want when you get it—send it back

It Is Easy to Do These Things

Write or send coupon at once for valuable information to all interested in beautiful handiwork. It is free. It tells you how easy it is to operate a Red Jacket set of tools and lists the advantages and privileges that are free to member craftsmen. Don't miss knowing all about Waco. It is free. You are invited.

Look out for imitations. There is only one Red Jacket—one Waco—one Wm. L. Aylward, Mastercraftsman.

Special Crafts Course FREE

SPECIAL CRAFTS COURSE and blueprint service is free to Red Jacket Shop owners—all that there is to know about handicraft methods, raw materials, woods, carving, sawing, turning, designing, carpentering, decorating, is taught by special correspondence.

Buy On Your Own Terms

Only $10.00 down. Liberal discounts for cash. Easy monthly payment plans. It is no hardship to own a Red Jacket.

SEND THE COUPON

Interesting Literature Free

Send the coupon. You will be surprised with all it contains. Beautiful, Instructive, Fascinating, Interesting.

Complete Only $10.00 Down
10 DAY FREE TRIAL

Tilt Top Table

FREE Blue Prints

Red Jacket MASTER DRILL

The most elaborate and unusual drill motor ever designed as driving power.

This Headstock furnished where no electricity is available.

WACO TOOL WORKS, Inc.
542 N. Parkside Ave.,
Chicago

Manager, Dept. 106. Please send me all free information and literature on Red Jacket Assemblies.

Name.....

Address.....

Adana Automatic Self-Inking
Printing Machine

NEW ALL-STEEL SUPER-MODEL

Complete

$19.50

Plant

Built from the experience of over 10,000 Users of the old Model.

Over 15,000 users of Adana Printing Plants, saving in their own work, and hundreds making an excellent living. Will print any matter from

Chemist's Label to An Illustrated Magazine

at a really good speed, including Perforating. Simplicity to the extreme, no special skill required. Large numbers of boys producing school magazines. Government Departments, Large Printers and Big Stores are amongst the many successful owners.

THE $19.50 PLANT COMPRISES:

Machine. Complete as above with padding cards.
Type. The finest Printers' metal type. Three complete sets. Each set includes composition of all letters, figures, signs, points, and spaces, making a total of nearly 2,000 pieces.
Type Cases. Three Fibre Cases to take the above.
Spacing Material. A set of both wood and metal, all being machine cut to a standard system of sizes so that type-setting for cards, billheads, noteheadings, labels, etc., is as simple as building with boys' toy bricks.
Ruling Material. A small set of brass rule for fine, heavy and dotted lines; together with a piece of perforating rule.
Wedges for Locking up. Galley. Steel tray for type-setting.
3 patent Registering Pins. Ink. Large Tin of Best Black.
Instruction Book. Profusely illustrated. 20 Pages.

Obtainable direct from our Warehouse. Dept. P.A.4.

THE ATLAS SHIPPING COMPANY
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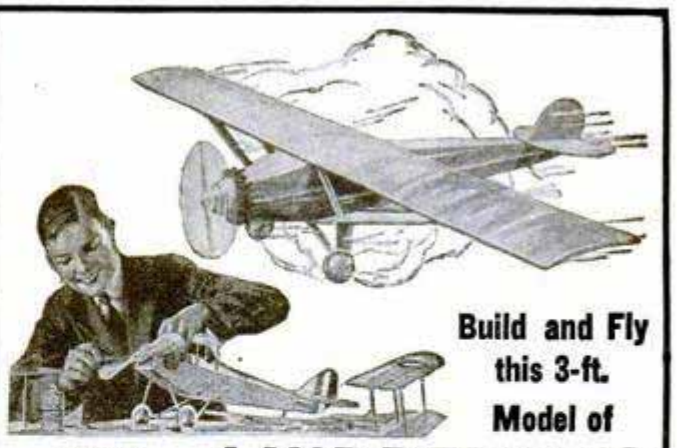

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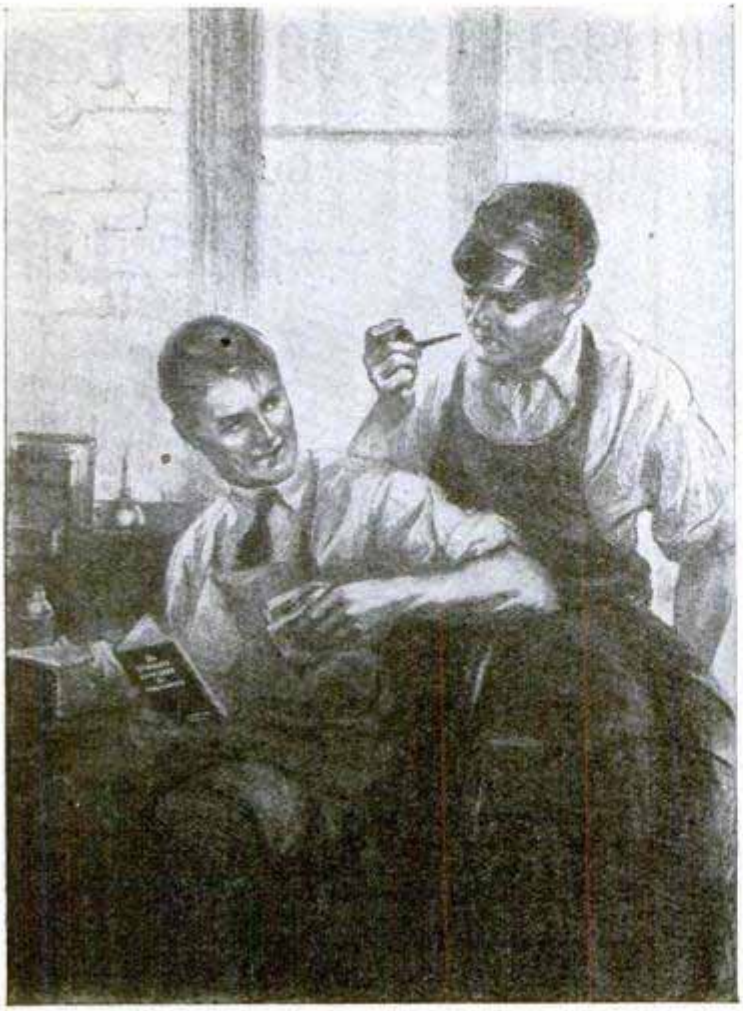

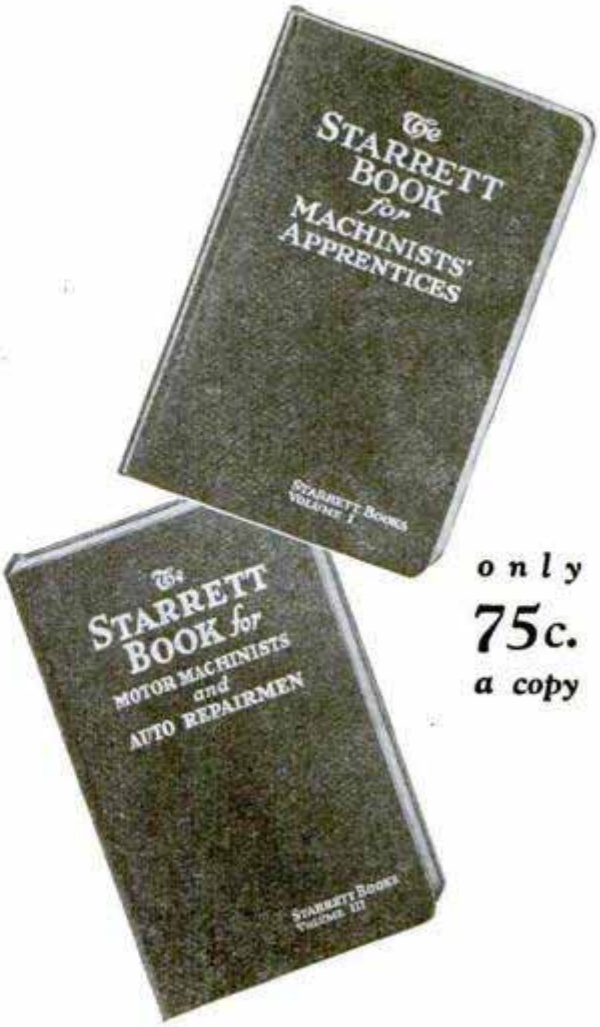

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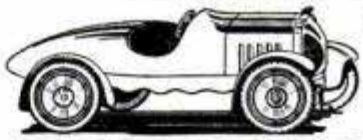

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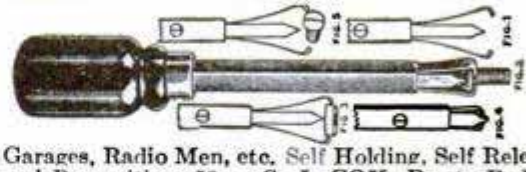

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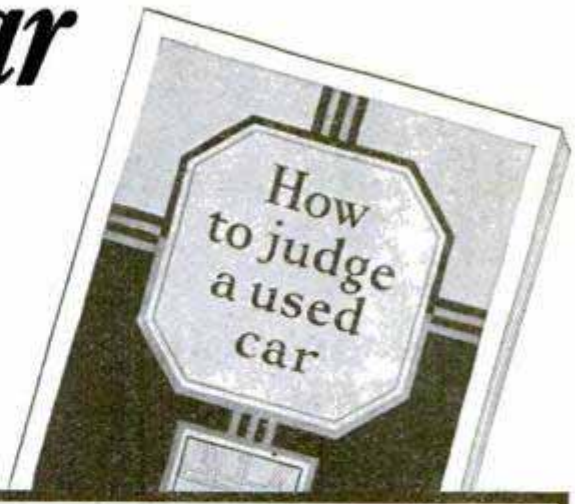

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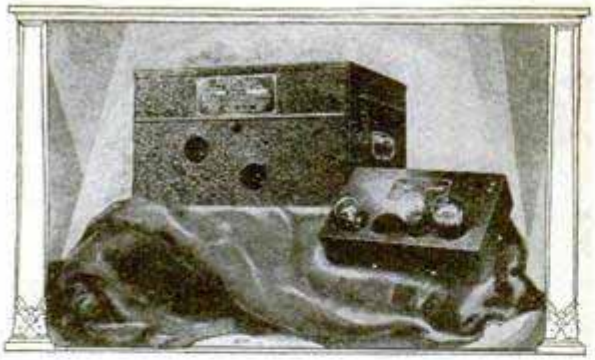

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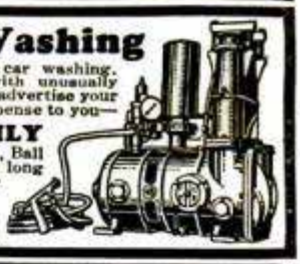

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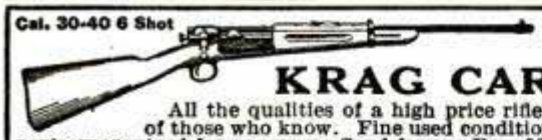

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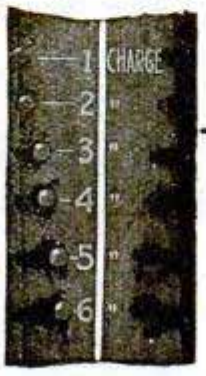

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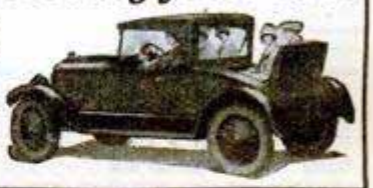

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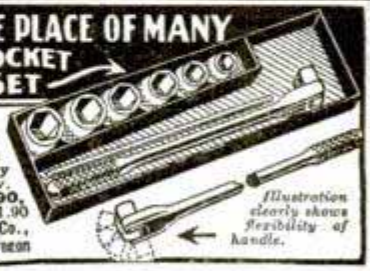

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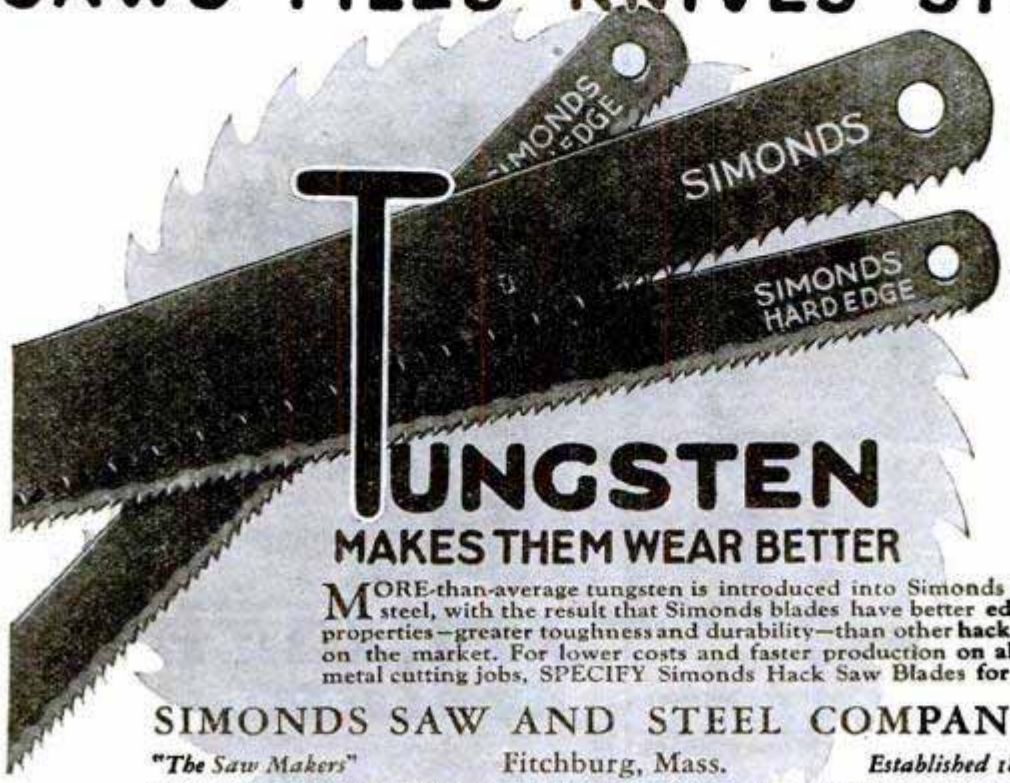

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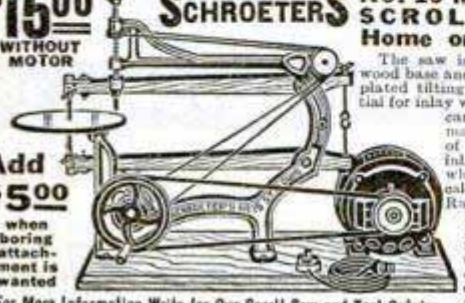

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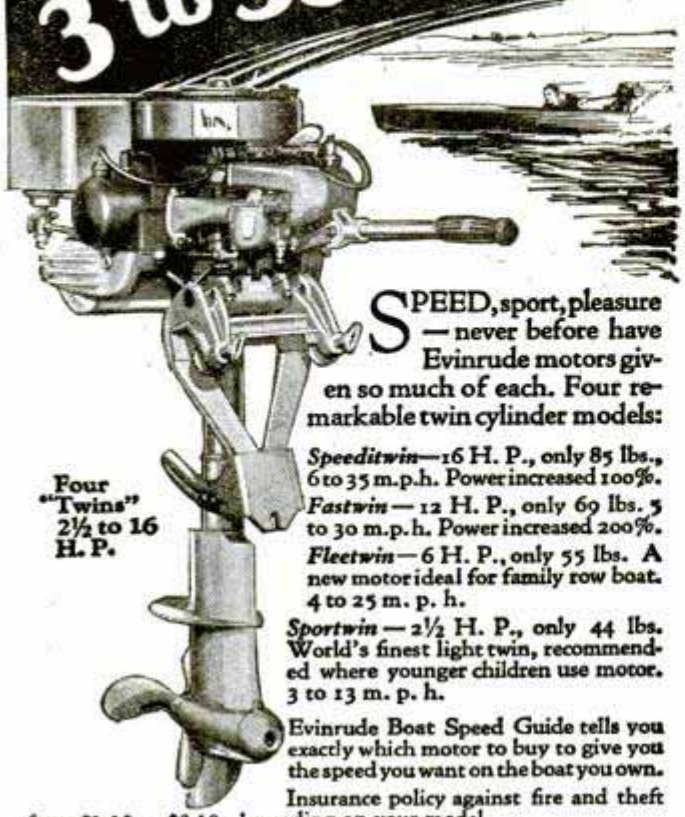

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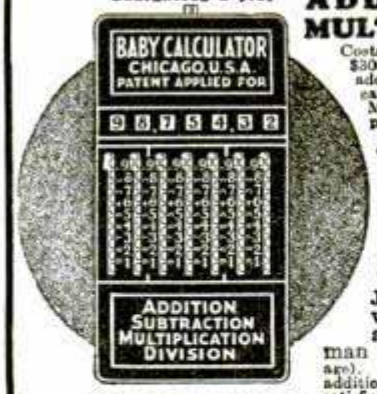

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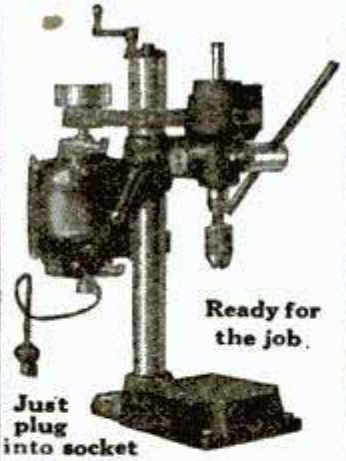

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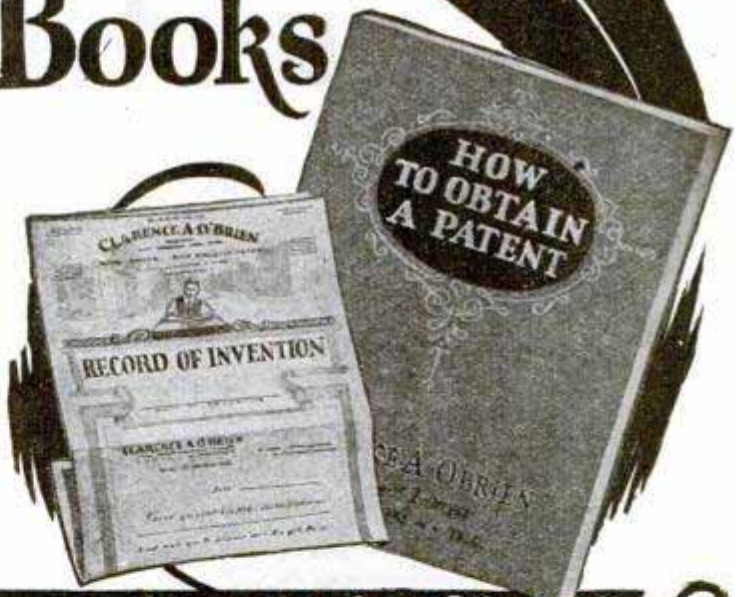

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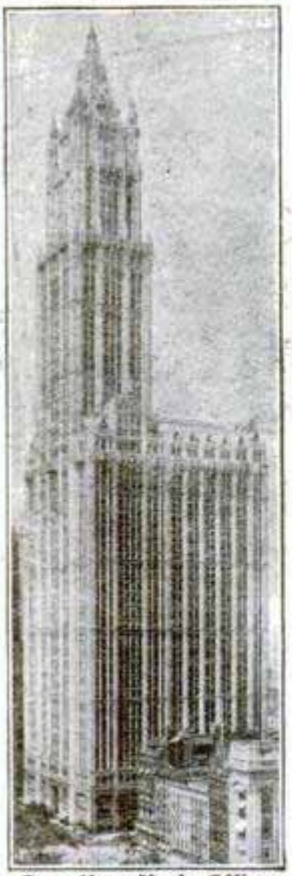

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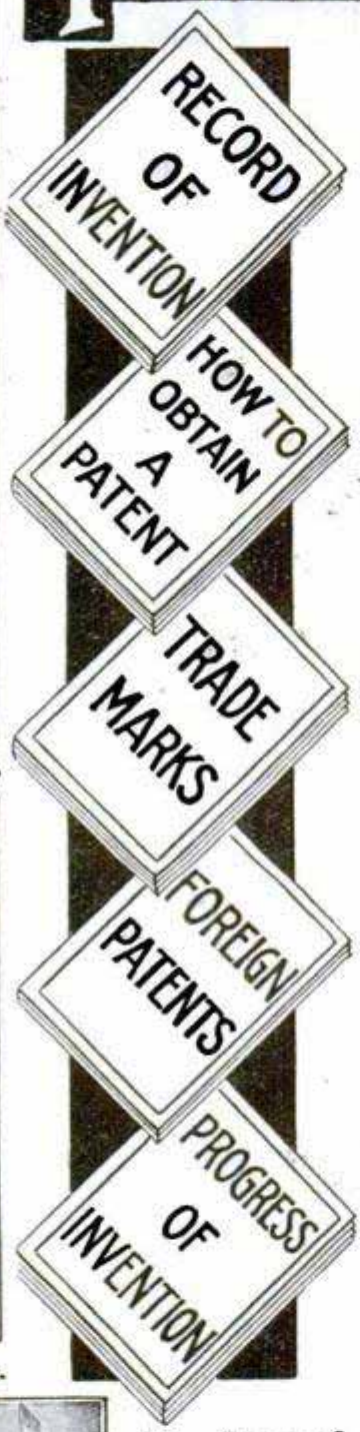

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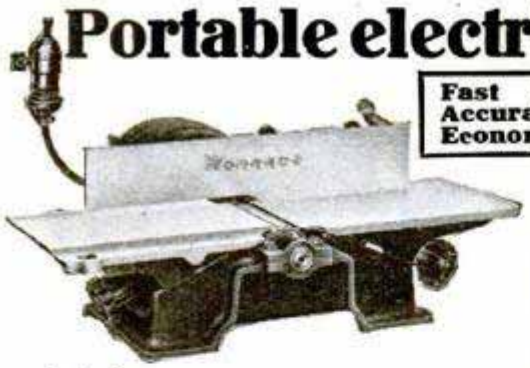

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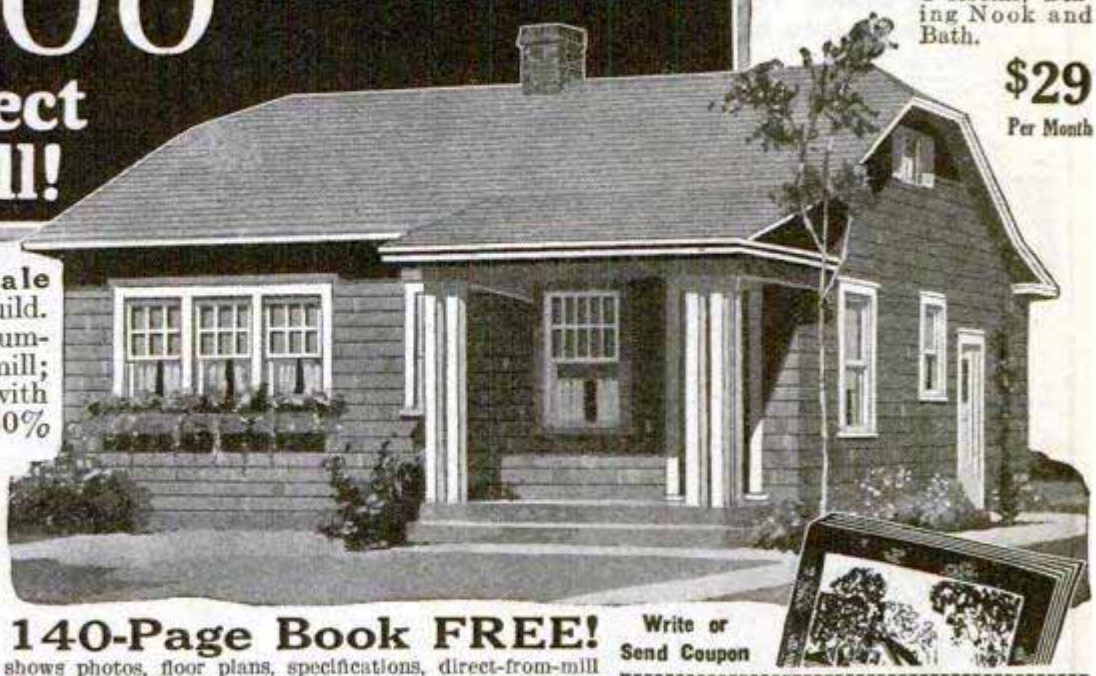

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Satisfaction Guaranteed or Money Back.
Please send me Book of 100 Home Plans.

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Best business builder and advertisement your shop can have if you sell to car owners.

Costs Only $12 Monthly
for a few months. Tire stores, Garages, Battery Shops, Filling Stations, are making big money with the new low priced HB Automatic Air Compressor—priced $75 to $100 less than similar equipment on the market. Ask for bulletin M 681—tells all about it.

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Price $10 and up purchased through our Co-Operative Plan for as low as $1.00 down and $1.00 per week
Indians Harley-Davidsons Ace Henderson and Clevelands
Send ten cents for Bulletin A.
Motorcycles shipped to all parts of the world
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50 New Features. Years ahead of old style engines. Run on Kerosene, Gasoline, Distillate or Gas. MORE Power—LESS Cost. Easy to Start—Easy to Use. 2 to 30 H-P. *Lowest Prices.* Easiest Terms. Catalog Free.
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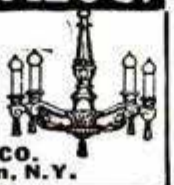

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Make this a Musical Summer THIS YEAR with PAN AMERICAN!

Play a Trumpet!

This summer you too, can play a band instrument. Vacation's the ideal time to learn. **Pan-American** Trumpets, Saxophones, Clarinets, or other wind instruments are so easy to play. When school opens you are ready for the band, or orchestra. Order a Pan-American (or any instrument of your choice) as they are **moderately priced,** factory-guaranteed, quality instruments.

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Send me Pan-American catalog of medium-priced band and orchestra instruments by return mail. I am interested in

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Make Your Watches, Clocks, Etc., Visible by Night

The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, **emits rays of white light, rendering it perfectly visible** in the dark. **THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, **price 25c.** Larger sizes, **50c** and **$1** postpaid. **JOHNSON SMITH & CO. Dept. 824 RACINE, WIS.**

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Roll your own and save money. Better and quicker; saves more than half. Use your favorite brand of tobacco. Neat, useful, handy. Pocket size, weighs ½ oz. Made entirely of metal, nickel plated. **25c, 3 for 65c postpaid anywhere.**

GOOD LUCK RING

Very striking, quaint and uncommon. Silver finish; skull and crossbones design, two brilliant, flashing gems sparkle out of the eyes. Said to bring good luck. **Only 25c ppd.**

Exploding Cigarettes

JUST LIKE ORDINARY CIGARETTES. BUT SUCH REAL STARTLERS! The box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. **Price 25c box.**

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Kissing Permit 10c *Garter Inspector 10c*

Two very novel metal badges, nickel plated, that you can wear, giving you fun out of all proportion to their trifling cost. **10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.**

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. Put up in boxes just like regular Safety Matches. As the victim tries to light one he gets quite a surprise.

Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

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GREAT CURIOSITY Smallest Bible in the World. Size of a postage stamp. **200 Pages.** Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Makes good money selling them to friends, church acquaintances, etc. PRICE **15c** each. **3** for **40c**, **12** for **$1.35**, **100** for **$7.50**. Also obtainable in Leather Binding, with gold edges. **Price 50c each, 3 for $1.25, $4.50 per doz. Magnifying Glass** for use with Midget Bible, **15c.**

Rubber Chewing Gum

10c Pkge. 3 for 25c P.Pd.

It is just like a regular package of chewing gum and looks so real that it fools everybody. Of course no one suspects it is not genuine until they start to chew it. There's a world of fun in this rubber chewing gum—5 sticks to the package. **Price, 10c Pkge.; 3 for 25c; 12 for 75c postpaid.**

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.**

Wonderful X-Ray Tube

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. A mystery that no one has been able to satisfactorily explain. **Price 10c, 3 for 25c, 1 dozen 75c. Johnson Smith & Co.**

Every Boy His Own Toy Maker

A great book for boys. It gives plain, practical instructions for making all manner of toys, machines and other articles, amusing and useful. Tells how to make a Steam Engine, a Photographic Camera, a Windmill, Microscope, Electrical Machine, Galvanic Battery, Electric Telegraph, Electrotyping Apparatus, Telephone, Kaleidoscope, Magic Lantern, Aeolian Harp; how to make Boats of all kinds, Kites, Balloons, Paper Toys, Masks, Card Racks, Wagons, Carts, Toy Houses, Bows and Arrows, Pop Guns, Slings, Fishing Tackle, Rabbit and Bird Traps, etc. 200 Illustrations. **PRICE 25c Postpaid. JOHNSON SMITH & CO.**

Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. **Price, only 25c Postpaid. Johnson Smith & Co.**

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Box contains **12 eggs.** When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most life-like manner.

Price per box, 10c postpaid, 3 for 25c.

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Protection against Burglars, Tramps, & Dogs

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1 Blank Cartridge Pistol
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1 550-page Novelty Catalog
ONLY $1.50
The Lot Shipped by Express Only
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Well made and effective, modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .22 Cal. Blank Cartridge—obtainable everywhere. **Special cash with order offer:** 1 Superior quality Blank Cartridge Pistol, **100** Blank Cartridges, and our new **550** page De Luxe Catalog of latest novelties; all for **ONLY $1.50.** Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges **50c** per **100.** Special Holster (Cowboy Type) for pistol **50c.** No C.O.D. shipments

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Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

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a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it.

Never Fails. A 16 page course on ventriloquism, the Ventrilo, ALL FOR 10 CENTS

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment . . . $1.00

Anyone Can Do Them

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fullyexplained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid.**

U. S. BABY TANK

It goes with real Yankee Pep—by its own power

25 Cents

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same lifelike manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run for toys. It will perform dozens of the most wonderful stunts; it will go backward or forward at will; 2¾ inches long. **Price only 25c prepaid. JOHNSON SMITH & CO.**

Look 35¢ Look

Wonderful Instrument.

Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngascope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. **Only 35c or 3 for $1.00**
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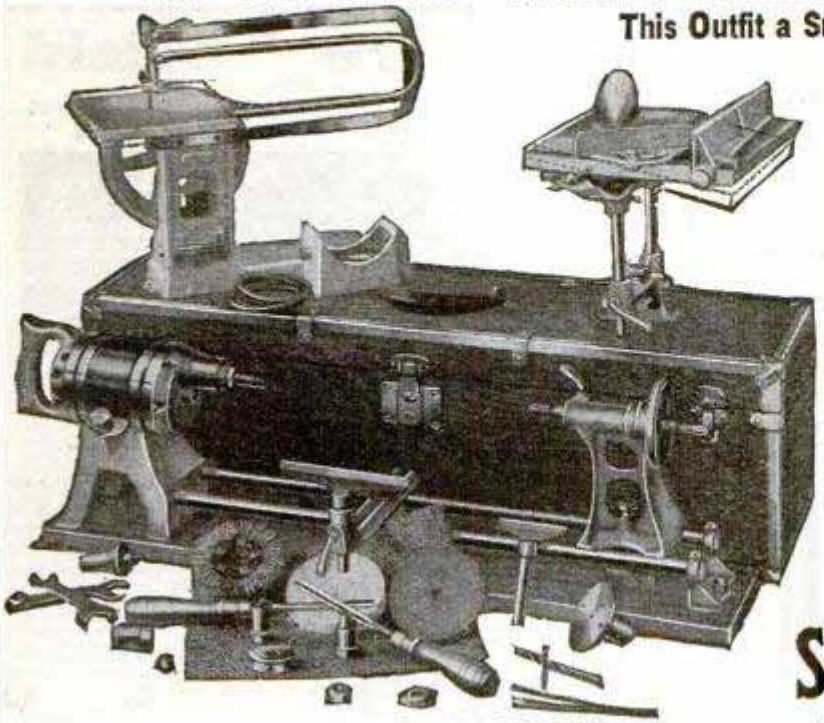
HOME MECHANICS MADE EASY WITH THE NEW "UP-TO-DATE HOME-CRAFTSMAN SHOP"



This Outfit a Superior Development Over All Others

The Up-to-Date Home Craftsman Shop can be used in any home lighting fixture, making of your old fashioned work bench a complete machine shop. Complete it is made up of a Super-Power Motor, a precision lathe (10" x 34"), featuring the bevel, a miter, side and depth gauges, a tilting table, jig-saw, and all accessories for buffing, grinding, cleaning and all portable or stationary drilling and sawing. This equipment will make you an advanced craftsman. Master mechanics have designed and skilled engineers have constructed this equipment which, after inspection, you will agree is the best of its kind. For those who build, invent, create and construct at home it is unexcelled.

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Under personal supervision of Master Craftsman Eugene E. Maurey, offers special correspondence crafts course, giving in simple detail full information on home handicraft. Blue print service giving plans and details for making hundreds of pieces of wood handicraft included in this course FREE to our users.

GUARANTEE

After receipt of the Up-to-Date Home-Craftsman's Shop, if you are not satisfied, without question or delay every cent refunded and return express charges paid.

THE SUPER-POWER MOTOR

The drive power of our shop equipment is positively the latest development in electric drill motors. It produces ½ H.P. operating on 110, 220, or 32 volt currents either A.C. or D.C. and is guaranteed not to burn out or wear out in the ordinary use of home or factory. It drives the lathe, circular saw, jig saw, a 15" band saw, a 4" jointer with amazing power and durability. For further details on this Super-Power Motor and the perfected shop it operates, mail the coupon at right **TODAY.**

SENT ON TRIAL

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for full particulars to Up-to-Date Machine Works 2915 S. Wabash Ave., Chicago, Ill.

MANAGER, Dept. 9. Without any obligation, please send me full particulars about your shop, 10-day free trial, free blue prints, free crafts course, also, $10.00 down payment offer.

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ADDRESS .....

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12-inch scale model of Lindbergh's Spirit of St. Louis. Scientifically designed and very realistic. Only scale model priced under five dollars that will rise from ground by own power. Flies 30 ft. or more and stays in air 8 to 10 seconds. Easily built in 2 or 3 hours. No tools needed. Construction set, with all parts and full directions, postpaid in U.S., only 50c. (no stamps). Satisfaction or money back. Send today.

Mann & Benton, Chillicothe, O.

Flying Cloud Model

Miniature model finishes 20" long. Complete in details. Set consists of Hull Block, 30-1/8" S. P. Blocks, Steering wheel, Anchor, Bell, Capstan, Bitts, Flag, Spar materials, Rigging, Brass wire, Pins, etc., also all materials for Deck Houses and rails. Complete set with instructions, $10.00 plus postage for 5 lbs. Hull shaped and sanded, $1.00 extra. Figure head 50c. Supply catalog, 10c coin.

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FOLLOW Sousa's advice and get into a band or orchestra. With a Conn instrument, used and endorsed by Sousa and his artists, you learn to play quickly. Then profit and pleasure open to you. Conn's many exclusive features *cost you no more.*

FREE Trial; Easy Payments. Write for the free literature, mentioning instrument.

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Here is an adding machine that sells so easily you'll say it's "like handing you money." You won't need any "sales talk"—just show it and it sells! A real adding machine—mechanically right—for only $10.

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At this low price every business man, every clerk, can have one on his desk. No need for a whole office force to depend on one costly machine. Sell them an AD-RITE for every desk.

AD-RITE

ADDS—SUBTRACTS—MULTIPLIES
Guaranteed for 5 Years

YOU CAN DO THIS
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You don't have to be a "high power" salesman—you don't need any experience. AD-RITE makes you a one-call man right off the bat. All you have to do is show it—work it—and state the price; they'll hand you a $10 bill and keep the AD-RITE.

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Not $150—nor even $25. Only $10—and it does the work! Quick CASH sales. **Spot cash for you.**

Tell me your offer to agents, and how I can get free AD-RITE sample machine.

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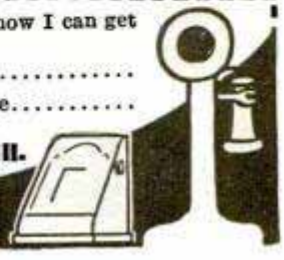

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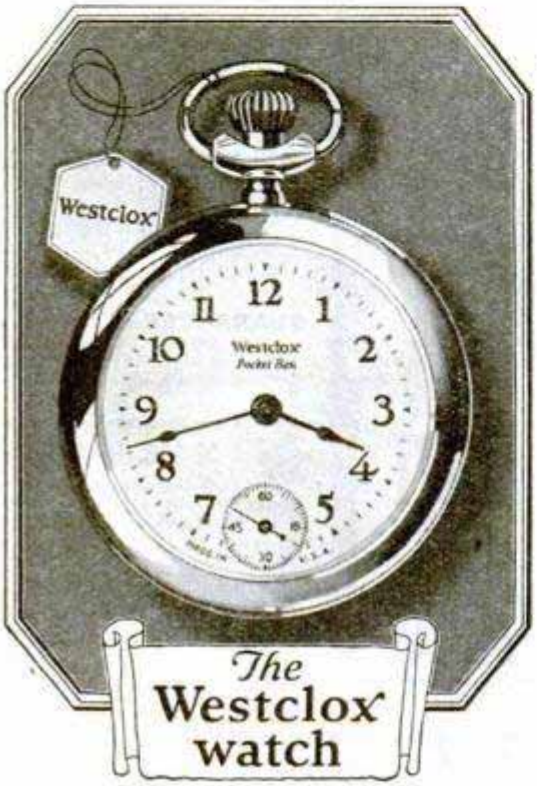

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HERE'S full value in a good-looking watch! The makers of Big Ben built it. The name Westclox on the dial stands for sturdy construction, long life and excellent time-keeping.

Millions all over the world rely on Pocket Ben with confidence. So can you. It's an ideal watch for your vacation. Sold everywhere for $1.50.

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Attractive, convenient, reliable. Fits any car. Quickly attached on dash or above windshield.

$2.50

Air Operated Glare Shield

Representatives Wanted

Makes Night driving Safe and Easy

PRICE TO INTRODUCE only $2

Positively ends glare. Attached on any car in an instant. No installing. The small triangular device hooks in the fabric above the windshield. The GLAREZ Shield stays up until you touch the bulb with your toe, then drops instantly to your eye level. The clear green celos shield makes night driving as enjoyable as day.

GLAREZ is a fine quality product. Constructed with precision and accuracy, appearance in keeping with the finest motor cars. Reduced so low that every motorist buys on sight. Mailed postpaid to any address in the U. S. upon receipt of $2.

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Make $10 to $50 a day and more from the start. GLAREZ, like the automatic windshield wiper, is destined to universal acceptance. Marvelous possibilities for Specialty Salesmen, distributors, and dealers, who write now.
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JUST HOOK IT ON THE STEERING POST

A fine high-grade rubber tube, (almost unnoticeable) extends down from the little device above the windshield, fits on the steering post at the floorboard with a small bulb at your toe. Good for years of service.

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Ground Out Static with SUB-AERIAL

Let Ground Waves Bring You Amazing Distance, Crystal Clear Tone Quality, and Greater Volume and Selectivity without Distortion.

Sub-Aerial has brought a new epoch in Radio. No need longer to bother with troublesome overhead Aerials. Why risk breaking your neck to put up roof aerials only to have the first storm blow them down? Forget your Aerial troubles. Why not use the whole earth as a static and noise filter with Sub-Aerial?

Can Be Installed in a Few Minutes

Costs No More Than An Overhead or Loop Aerial

and less than many. Hook your set on to the newly discovered Ground Waves that bring practically static-free reception. Don't stand for the squawks and tin pan reception you get from Air Waves when you can step right out **and leave that stuff.**

If you don't believe us, try it yourself. If you do not find we're right—absolutely right—you don't pay us a cent for the test.

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We know so well the surprising results you'll get that we'll let you put in a Sub-Aerial entirely at our Risk. Don't take down your overhead Aerial. Pick a summer night when static and noise interference on your old Aerial are "Just Terrible." If Sub-Aerial doesn't **Sell Itself to You Right Then on Performance**—you needn't pay us a cent. Send for "all the Dope on Sub-Aerial." You'll be surprised. Do it NOW.

UNDERGROUND AERIAL SYSTEMS
St. Clair Building **Dept. 8-H**
Cor. St. Clair and Erie Sts. **Chicago, Ill.**

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BIGGEST VALUE-LOWEST COST

Buy your metal roofing, shingles, Spanish tile, sidings, etc., DIRECT from the world's largest manufacturer of sheet metal building materials, at BIG SAVINGS. Thousands of satisfied users.

We own our own rolling mills. Enormous output insures lowest production costs. Factory-to-consumer plan makes prices **rock bottom.** You get the benefit. Many varieties. Edwards metal roofs last longer, look better. Resist rust, fire and lightning. Roofing, shingles, etc., of COPPER BEARING STEEL at special prices. This steel stands the acid test. Outlasts the building to which applied.

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Low in cost. Easily erected. Permanent. Good-looking. All types and sizes to suit your purse and purpose. Now's the time for action. Write for Roofing and Material Book No. 150 and for Garage Book.

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SPINNING AUTO LIGHT—Spins with the wind. Red, White and Blue trick light. Most beautiful light in the world. Everybody wants One. Auto, motorcycle, airplane, canoe. Put on any auto in few minutes. Radiator, mudguards, side or top. Just patented. Be first. Pay when you receive the flasher $1.50 plus postage. Money back Guarantee. Send today.

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Worn by practical men everywhere. Shock proof, weather proof. Perfect time keeper. Radium dial. Tells time in dark. Fine imported full jeweled movement. Rich silver finish. Genuine leather strap. **Sold elsewhere for $10.00.** Satisfaction guaranteed. **SEND NO MONEY.** Pay on delivery $3.99 plus the postage. **JENKINS CORPORATION, 621 Broadway, New York, Dept. 23 F-6.**

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Multitudes of persons with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Antiseptic Ear Drums. Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are Unseen Comforts and inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.

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Big Money Everywhere!

THREE Chicago food experts have created a new kind of business in which any honest, industrious man or woman can make from $50 to $250 a week the easiest way you ever heard of. They have worked out a simple, complete and proven plan by which you can immediately become the owner and operator of a big food business. You start making money the very first hour.

Works Like Magic!

Part of the complete plan that will be sent you is a wonderful invention of one of the experts—a machine that cooks *greaseless* doughnuts by electricity. Everything you need to make as much as $1,000 a month.

A Remarkable New Food!

The greaseless doughnut is an entirely new food. Not a drop of oil or grease is used. It is a crispy, fragrant, appetizing doughnut cooked by electricity. More captivating than old-style doughnuts—rich as pie or cake—yet easily digested as bread.

People literally fall over one another to buy these new dainties. That's why Minch made $3,000 in 3 months. Costopolis, Illinois, takes in $6 to $7 an hour in the evening. Mrs. Jane Statts, Chicago, becomes the owner of a big shop in less than 2 months—All kinds of people have coined money in this amazing new business.

The Secret of Big Money

Mail coupon *now* for complete details of plan through which many make enough money the first few days to pay for the machine—with profits up to $1,000 a month waiting for you. If you are interested in a steady income of $50 to $250 a week *mail the coupon today.*

Food Display Machine Corp.
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Rush me proof of $1,000 a month. Also send details of your liberal co-operative Plan.

Name.....

Address.....

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8,000 IN USE!

A SHOPFUL OF TOOLS WITHIN ARMS REACH!

$35 F.O.B. PHILA

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TABLE TILTED FOR BEVELING

DADO HEAD ATTACHED FOR GROOVING

IN THE short space of four years, the Devitt 8-Inch Combination Saw has become a practical necessity in thousands of shops, factories and households everywhere. Many imitators have sprung up, but Devitt leads them all. Think of the convenience and economy of this handy little machine that will rip, cross cut, bevel, miter, groove, mortise, tenon, drill, rabbet, grind, buff and polish. Attachments are easily and quicky adjusted. The saw and motor, when set up for work, occupy very little room. Saw is equipped with ⅓ H.P. 60 cycle, 1750 R. P. M. 110-volt A. C. Motor which can be attached to ordinary light socket, and provide power for other purposes when wanted. A cut up to 2¼" can be made without planing. Comes complete with following attachments—12"x16" table, 8" Combination Saw, iron pulley for saw table, 10" ripping fence, adjustable cut off miter gauge, motor-specifications as above, 1¼" endless leather belt, wood pulley, 8 ft. cord and plug, 6" buffing wheel, ⅜" 3 jaw drill chuck, 5" emery wheel, 6" sander, saw guard, and 2" dado insert. $35.00 F. O. B. Phila. Height 7½", shipping weight, 100 lbs.

(Only $12 extra for Planer Attachment to fit on table top. Can smooth pieces up to 2 inches wide. Price, F. O. B. Phila.)

Send today for our attractively illustrated 4-page circular

PAUL J. DEVITT

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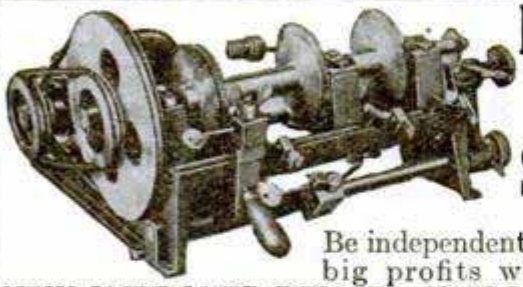

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NEW IMPROVED BEISSER KEY MACHINE

You can start a business of your own, no experience necessary. The only key machine that cuts ALL kinds of keys. No hand-filing. Make first keys by number without taking locks apart. Locksmith instructions furnished free. *Write today for Full Particulars.*

BEISSER KEY MACHINE COMPANY

407 Fort St. East Detroit, Mich., U. S. A.

Your Coat and Vest Can Be Matched with New Trousers

Get full wear out of that good coat and vest by buying **New Trousers to Match**

You save the cost of a new suit. Each pair tailored to your measure. Over 80,000 patterns to choose from. Mail vest or sample of your suit and we will submit sample of cloth for approval.

Enclose return postage if vest is sent.

We employ no agents.

ACME PANTS MATCHERS

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$1 DOWN

21 Jewel Burlington

Nothing less than 21 Ruby and Sapphire jewels is good enough for the Burlington masterpiece.

Quality and Style

Adjusted to the second—temperature—isochronism—positions. 25 year Gold Strata Case, in 100 designs. $1 down. Balance in small monthly payments. **Send for free book.**

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Reg. U. S. Pat. Office

WORKS WHERE OTHERS QUIT. No job is too small for this remarkable double edged tool. Works in the smallest and most difficult places to reach. Takes care of the big jobs too. Hardened milled teeth will saw anything from bakelite to steel. **Everyone who has use for a hacksaw** will find the KIT-HAXAW an invaluable time-saver. Actual size over all is 10 in. Blade is 1-32 in. thick. Comes complete with handle and blade and two extra blades for only $1.00 Postpaid.

DEALERS: Write TODAY for details of this interesting proposition.

GEORGES PICARD CO., Inc. 105 Water Street NEW YORK CITY

The Super Elto Quad

4 Cylinder Outboard Motor

OLE EVINRUDE'S sensational new achievement. Develops 18 H. P. — easily drives stock racing boats better than 35 miles per hour. Drives sturdy runabouts 25 m. p. h. Absolutely vibrationless. Dual ignition, dual carburetion, instant starting. Terrific, zooming acceleration, exceptional handling ease. Weighs only 92 pounds. Send for free book on the *Three Great Super Eltos*. Describes the 4-cylinder *Quad*, the new B Class *Speedster* and the famous *Service Twin*. Write today.

ELTO OUTBOARD MOTOR CO.
Ole Evinrude, President
Mason Street Department AA Milwaukee

$1 *Greatest Value Ever Offered* **$1**

MACOY'S 5 Window PASS CASE

Genuine Gold Corners
Morocco Goatskin

Well made in every way. Edges turned and stitched; pocket for business cards; Shrine or Masonic Emblem FREE. Gold stamping, name and address, 35c. per line extra. **Clip this adv. and enclose $1 bill.**

5 Window Pass Case.....$1.00
9 Window Pass Case.....$1.50
13 Window Pass Case.....$2.00

Masonic Books, Monitors, Bibles, Leather Goods, Novelties, Radiator Ornaments, Jewelry, etc.—Write for Catalog No. 8.

MACOY PUB. & MASONIC SUPPLY CO.
35 W. 32nd St. NEW YORK
Oldest and Largest Masonic House—Est. 1849

43.8 Miles on 1 Gallon of Gas

(Affidavits on File)

This Simple Device Can Be Installed on All Cars

AGENTS—Make $250 to $750 a Month

$15.00 a Day Guaranteed to Producing Distributors

TRIAL COSTS YOU NOTHING

Send quick for Proof and big money making proposition.

Get FREE Tire Offer

Write for Full Information

Blancke Auto Devices Co., 154 E. Erie St., Dept. 805-H, Chicago

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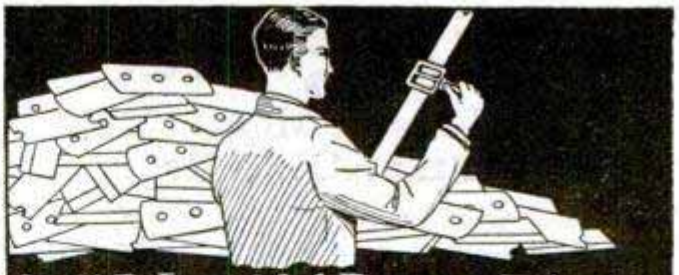


Sell Your Old Razor Blades $1.00 for 10!

We'll pay you for your old razor blades! NOT NEW ONES—we want them old, the older and duller the better! We want the kind you'd think no sharpener could possibly give a keen shaving edge. Our representatives use them to demonstrate an amazing new invention—absolutely nothing like it—an AUTOMATIC sharpener with a flexible Hone-Strop—actually gives the TRUE barber stroke and instantly blesses dullest blades with the keenest possible edge. Read this big offer.

New "Mechanical Wrist" Sharpens Blades Like Magic!

Here's a light, handy device as different from ordinary sharpeners as Lindy's "WE" from Langley's first crude flying machine. In the first place, it's the one sharpener that both *hones* and *strops*. The FLINKER sharpens all makes (larger size for Durham-Duplex). And it's *automatic*—turns blade on strop exactly like the master barber gives his razor its super-sharp edge! No "threading" of strop through holder—clever guides hold it! Can't cut the strop! A few pressure strokes, a few light ones—2 seconds and your blade is marvelously keen. One blade will give you smiling shaves 365 days! We guarantee these things! The amazing new FLINKER BARBER STROKE SHARPENER offers the strongest money back guarantee ever devised. No matter what you've tried—or what you now think—here's a sharpener that will positively give you a satisfying answer to every safety blade problem! IT DOES ACTUALLY MAKE NEW BLADES FAR SHARPER, AND YOUR OLDEST BLADES SHARPER THAN NEW!

Here's An Amazing Offer!

Do this: Run an old blade over a hard surface, or cut wood, to bend the edge! Then give it a few strokes with this device. You'll positively find it keener than new! You're so sure to be amazed and delighted the first time you use the FLINKER BARBER STROKE SHARPENER that we make you this astounding offer. We will give you 10 cents each for your old razor blades—limit for each person 10 blades—which you subtract from the retail price—$3.90. Send balance for the sharpener. Try 5 days. Test it thoroughly. Then if you don't say it's the most wonderful sharpener you ever saw—if it doesn't give you your greatest shaving joy—send it right back. WE WILL REFUND YOU THE FULL RETAIL PRICE $3.90! Whether you've sent us one or ten blades, we'll pay you the full price! Could anything be fairer? Will you make this test absolutely without risk? This offer is limited. Send TODAY!

AGENTS

This new invention is selling like wild-fire! Croft, Michigan, earns $33 in one day—McCaw, Illinois, $137 first week. No matter your experience, here is big, fast money. It's a shaving sensation! Men buy eagerly and it positively does do every amazing thing we claim for it. Check coupon for full information, without obligation. It's a big opportunity for you if you want to earn $100 and up a week.

FLINKER SALES CO. Dept. D, 206 East Grand River, DETROIT, MICH.

Flinker Sales Co.,
Dept. D, 206 East Grand River, Detroit, Mich.

( ) Inclosed ..... old razor blades at 10 cents each and $..... for one FLINKER Barber Stroke Sharpener under Money Back Guarantee.

( ) Inclosed regular price $3.90 (I'll keep my old blades and make them better than new).

( ) Send information about acting as your representative.

Name.....

Address.....

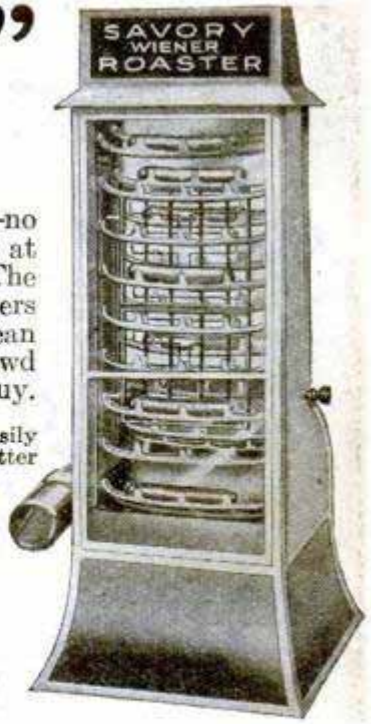
City.....State.....

Selling "Red-Hots"

Always a Money-Making Business —And NOW a Regular Gold Mine!

There has always been good money in selling "red-hots." Now here is a NEW way of cooking them, that means *more* money—liberal chunks of it—selling clean, sanitary, delicious, *roasted* "red-hots" from the SAVORY Electric Wiener Roaster. With this machine you can turn out a vastly better product—with all the flavory juices cooked in—and get the trade from the stands selling the flavorless boiled "dog" or a dried, shriveled, fried product.

No stove or fuel to bother with—no muss, fuss or dirt—just hook it up at the nearest electric service outlet. The constantly moving baskets roast wieners deliciously brown—the bright, clean enameled machine attracts the crowd and makes them stop, look and buy.



SAVORY ELECTRIC WIENER ROASTER

Small, complete and easily moved, this new and better method of *roasting* "red-hots" with the SAVORY Electric Wiener Roaster will prove a regular gold mine for you.

SAVORY Electric Rotisserie

Juicy roasts, delicious broilers, meats of any kind—all roasted to perfection in this SAVORY Electric Rotisserie. Portable, compact, sanitary and perfect in operation, it gets the crowds and brings in big money.

Send for Details of These Machines

At fairs, picnics, ball games, roadside stands, beaches—any place in a crowd these machines will draw the trade. Both have distinctive features that make them regular "gold mine" profit makers—and the price is right. Write for full details.

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Free Bulletin lists diamonds as low as $60 per carat, also **Gems of Finest Quality** at higher per carat charges, but proportionately **Low Bargain Prices.** This 3/4 less 1-16 carat correctly cut diamond, a snappy blazing solitaire at $68.50. *This 75 year oldest largest Diamond Banking Firm in all the world* lends money on diamonds. Thousands of unpaid loans and other bargains. Many from big cash deals direct with European Diamond Cutters. Must sell NOW.

$68.50
3/4-1/16 Carat Correctly Cut

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Any Diamond sent for absolutely free examination at our risk. No obligation. No cost to you. Latest Listings—Unpaid Loans. Sent Free. Describes Diamond Bargains in Detail, gives cash loan values guaranteed. Explains unlimited exchange privilege. **Write today for your copy of Diamond Bargain List.** Use blank below, clip ad and mail.

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Tear out and mail today to— **Jos. De Roy & Sons,** *Only Opposite Post Office* **1969 De Roy Building Pittsburgh, Pa.**

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Powerful 6-7 or 8 Tube Guaranteed RADIO

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Pioneer Builders of Sets
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Fly balloons, balloon kites, sell balloons, GREAT FUN

Special Spring Prices

No. 1 Inflator, 50c postpaid.
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SAVE 30 TO 80% ON AUTO PARTS

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$34.75 to $66.66

Licensed R. C. A. Circuits. Shielded. One Dial

Write for catalog. Big discounts to agents

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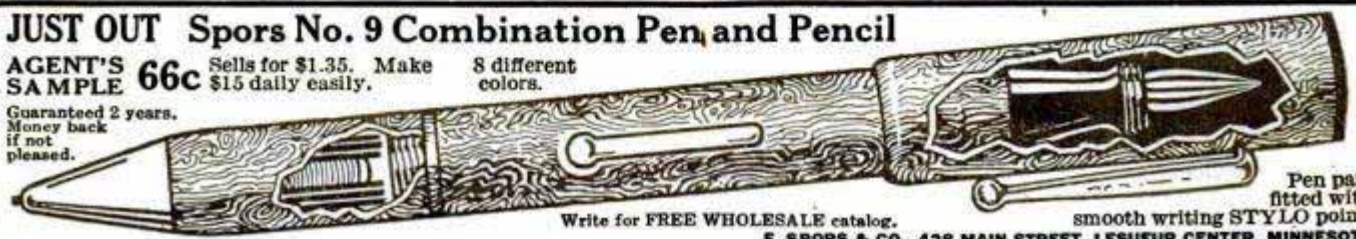
AGENT'S SAMPLE 66c Sells for $1.35. Make $15 daily easily. 8 different colors.

Guaranteed 2 years. Money back if not pleased.



Pen part fitted with smooth writing STYLO point.

Write for FREE WHOLESALE catalog.

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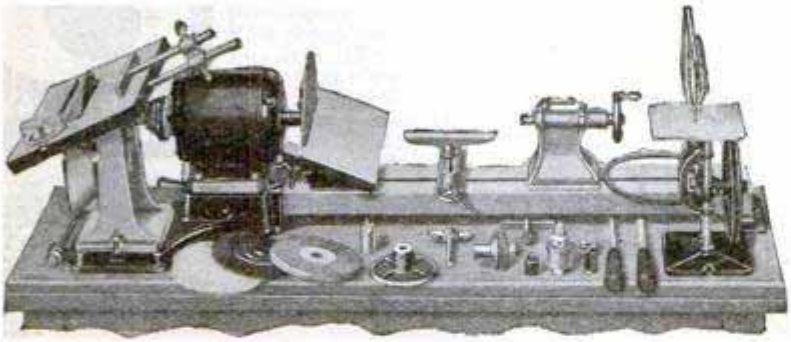
DELTA Handi-Shop



No other shop offers so much machine-value per dollar

The joys of craftmanship are made easy with this unusually designed, carefully built shop with its two shaft motor that permits as many as three tools being ready for work at one time. You will be surprised at the ease and speed with which it accomplishes an exceptionally wide range of difficult work, due to the fact that the **Delta Handi-Shop** embodies so many unusual and exclusive features.

Send Coupon NOW!

Gratify your desire to make things. Develop your creative and inventive ability. Make money in full or spare time. Spend happy hours in interesting, healthful diversion. **Don't delay! Send the coupon now.** Get full particulars—interesting details—actual photographs of some of the unusual work done by this remarkable shop.

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Send me your illustrated color folder describing Delta Handi-Shop. Tell me about your Free Trial Offer, Free Blue Prints and Easy Payment Plan.

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BOYS! FLY THESE CLASSY RACING PUSHER AIRPLANES

20" Red Hawk—flies 150-200 feet...85c
24" Albatross—flies 200-300 feet..$1.10
ORDER NOW

36" Twin—flies almost half a mile $5.00
10" Carved Propellers.....50c each
PROMPT SHIPMENT

MARX MODEL AIRCRAFT CO.
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Build Your Own OUTBOARD MOTOR BOAT

The Hartman Outboard Motor Boat comes to you all ready to put together in a few hours pleasant work. Saves *at least half*. Length 13' 8", beam 46". Finest materials: Mahogany planks, Spruce frame, Oak keel, etc. All parts cut to shape accurately. Instructions make it easy.

All parts complete, including brass and copper fastenings and fittings, instruction booklet, etc. **$98** F. O. B. Nyack

Send for Printed Matter—FREE

HARTMAN KNOCK-DOWN BOAT CO. NYACK, N. Y.

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with a BERGHMAN LAWN MOWER SHARPENER— You can easily and quickly use a BERGHMAN and get wonderful results. It is adjustable and lasts forever. Just a few strokes on each blade and your mower cuts like new. **KEEP YOUR LAWN MOWER IN SHAPE THIS SUMMER** by sending today for this handy sharpener.

$1.95 (Postpaid)

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5737 W. Chicago Ave. Chicago

EASY $100 a Week

FUGO FIRE EXTINGUISHER

Unusual opening for live agents in every locality. Make $5000 or *more* a year—*easily*. Fugo—the instantaneous automatic fire extinguisher—is needed and wanted in every home, store, theatre, garage, shop, school, automobile, etc. Cheapest fire protection available today. Within reach of all.

1 Qt. Size $5.00 **2 Qt. Size $7.50**

Recharged in a jiffy

Amazing 30-second demonstration clinches sale—each one sold sells others. Territory going fast. *Write at once for wonderful proposition that will make you big money.*

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START to PLAY Very First Day!

Extra Money—Hosts of Friends—Loads of Fun Within Your Reach

Fame and Money Broadcasting

Center of Attraction at Gatherings

Big Money at Dances

HAPPY DAYS are in store for you if you will only act on this suggestion! Cheery evenings playing catchy music alone or with sweetheart, wife or sister; proud moments as *center of interest* at gatherings; nights of joy making **$5** to **$25** for work that is "play."

The Deagan Xylorimba is your Opportunity! Wonderful for home, in demand at dances and entertainments, *yet easiest of all instruments to play.* No teacher necessary—you actually play simple melodies the very first day even if you cannot read a note of music right now!

Earns $60 a Week -- Ralph Smith, Chicago, says: "Played 20 minutes at wedding. Received $20." L. E. Hallmann, Reading, Pa., writes: "Made $300 in 5 weeks, spare time. Had never played instrument before."

SEND FOR BIG FREE BOOK! Our new book tells all about the delightful lessons, furnished with each instrument; the five-day trial that removes risk; the wonderful Deagan easy-payment plan. No obligation—simply fill in and mail the coupon.

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IF YOU CAN USE AN EXTRA $20.00 BILL

write for this

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You can save $20.00 in no time by using

SMOOTH-ON No. 1

to do your own household repairing—and in addition you will have that proud "I-did-it-myself" feeling.

Here is what one enthusiast did with two 35 cent cans:—A $25 lamp stand loose in base, two big leaks in heating furnace smoke pipe, loose hammer handle, and three loose hooks in tiled bath room wall were all put into good usable condition at an average cost of 10 cents each for the seven repairs—and $20.00 easily saved over what would have been paid to professional fixers or for new parts.

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Please send the free Smooth-On Repair Book.

Name.....

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6 **Return this coupon for a**
28 **FREE copy of Booklet**

SENSATIONAL Typewriter Offer

3 AFTER 10 DAY FREE TRIAL

DON'T SEND US A CENT—we'll ship you a *genuine* L. C. Smith for a 10-Day Free Trial. Put it to any test in your home or office—no one will urge you to buy. Compare it with any machine made. Then, if you decide to keep it, we'll make you the LOWEST PRICE EVER OFFERED and give you EASY MONTHLY PAYMENTS so small you'll never miss them.

The ONLY Ball-Bearing Typewriter

Because of its ball-bearing construction, the L. C. Smith is the *easiest running* and *longest wearing* typewriter made. ALL THE 1926 ATTACHMENTS.

Guaranteed for 5 Years

HIGHEST QUALITY re-newed. Don't buy any typewriter until you have tried an L. C. Smith. For the sake of your future satisfaction, accept our FREE TRIAL OFFER.

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By acting now, you get Tools, Waterproof Cover, valuable Home Study Course in Touch Typewriter Free. Play safe. *Use* the ball-bearing L. C. Smith 10 days before deciding on any machine. Write TODAY for details of our Special Offer and manual of typewriter information.

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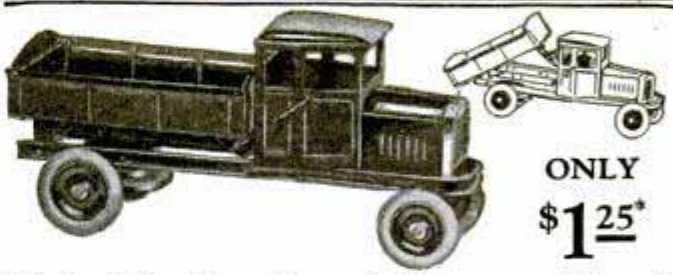

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Send 10c for novel Kingsbury Disc Wheel Eraser. Complete Catalog Free

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WHEN you're hunting down the reason why the wheels won't go round, you need that very best of mystery-solvers—a good flashlight. With your Eveready on the job, there's a bright, watchful eye of light at your service, searching out the dark places that hide the important clues.

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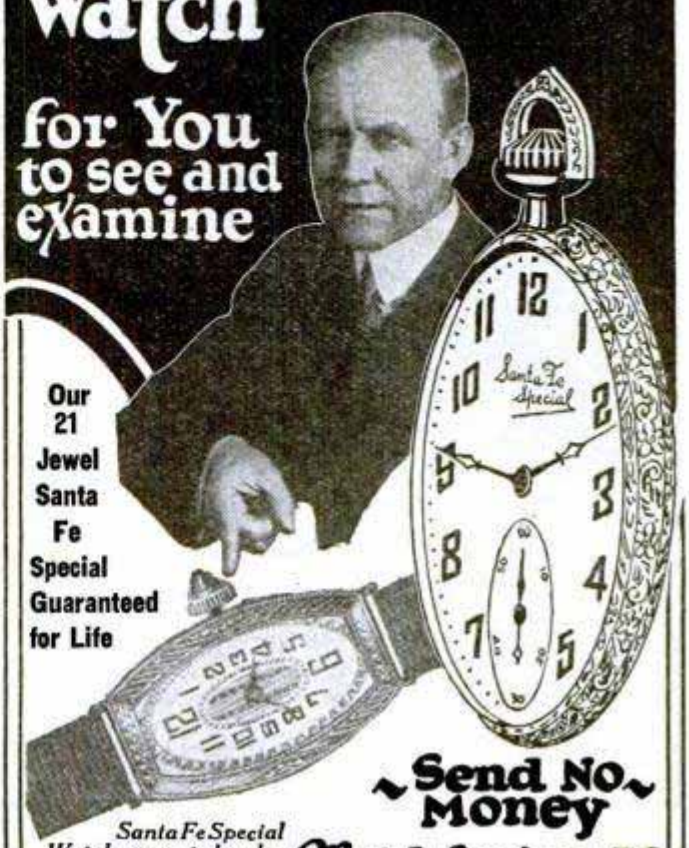

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In addition to our NEW LOW PRICE, I will send for your approval one of these Standard Watches, guaranteed for a lifetime of satisfactory service, not only by the Santa Fe Watch Company, but by the Great Illinois Watch Factory. So accurate, Government officials carry them; so perfect and beautiful, jewelers say they are worth 1-3 to 1-2 more than we ask for them. I will send you one to see WITHOUT ONE PENNY DOWN—allow you to wear it 30 days FREE—then sell it to you on easy payments.

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Mail coupon today!

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Please send prepaid and without obligation your Watch Book Free, explaining your "No Money Down" Offer on the Santa Fe Special Watch.

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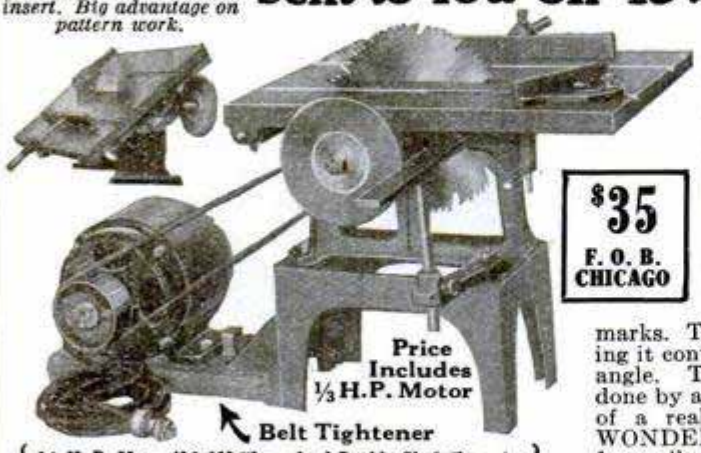
18 Tools In One 8" Combination S&B SAW

Money Back Guarantee

12" Band Saw

The only machine that you can tilt the table to 45° without removing insert. Big advantage on pattern work.

Sent to You on *15 days approval*

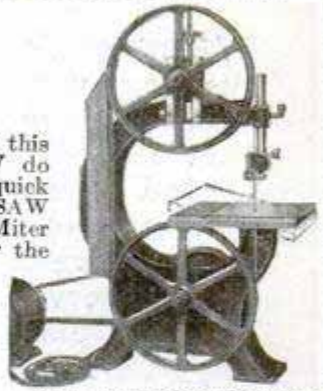


$35 F. O. B. CHICAGO

⅓ H. P. Motor-40°-100% overload Double Shaft Extension

12" Band Saw

Positively a sensation and at this LOW PRICE you can NOW do the 1001 things you wanted quick and easy. This 12" BAND SAW has a tilting table, with Miter and sturdily built. Ideal for the shop or home.



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Here is the outfit of practical usefulness. Will cut wood and light metal true to marks. Table top tilts to 45 degrees, making it convenient and easy to cut at proper angle. Thousands of jobs can NOW be done by any man or boy with the accuracy of a real mechanic. This S&B WONDER SCROLL SAW is free from vibration.

Scroll Saw

Delights Every Boy

$15.00 F. O. B. CHICAGO ⅓ H. P. A. C. Motor $12 extra

18 Tools in One—Greatest Machine You Ever Saw

THE S&B 8-in. COMBINATION SAW (18 tools in one) is the ideal machine for the shop, factory or the home; will rip, cross cut, bevel, miter, mortise, groove, drill, tenon, grind, rabbet, buff and polish. Motor is mounted on a base that is a part of the machine proper. Run from any light socket, also provides power for other purposes when the saw is not in use. Complete with attachments and price includes 1-3 H. P. Motor, 60-cycle, 110-Volt A. C. Price $35.00 F. O. B. Chicago. Shipping Weight 100 lbs.

(Planer attachment to fit on table top will smooth pieces up to 2 in. wide, $10 extra.)

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only $6.85 complete

FREE TRIAL

Banish forever all the annoyance and expense of buying new "B" Batteries with a TOWNSEND "B" POWER UNIT. Hooked up in a few moments—and you have permanent power from your light socket from that time on. Use same tubes now in your set. No changes needed.

You'll be amazed at the way Townsends improve your reception and add to distance getting. More than 50,000 now in use. Send coupon today for full information and free trial offer.

Townsend Laboratories,
713 Townsend St.,
Dept. 15
Chicago, Ill.

COUPON

TOWNSEND LABORATORIES,
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Please send me full information on the Townsend "B" Power and Free Trial Offer.

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Address.....

$100 a Week Showing Merchants It Pays To Advertise

R. O. Gosden of Michigan made $321.05 in 9 days—sold 5 machines in 2½ hours.

THE EUREKA ADVERTISER
(Automatic Wrapping Paper Printer)

Automatically prints the merchants' "ADS" on his wrapping paper in one or two colors. Costs only what it costs to have "AD" printed on twenty rolls of paper. Flint of New York sold four machines in two hours. You collect and keep your commission. We deliver. Every merchant a prospect. Many buy five or more machines—one for each paper rack they use.

SALESMANAGER, Dept. A, 1201 Cortland Street, Chicago, Illinois

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ALADDIN GOOD LUCK RING, ENTIRELY NEW

Made of jet black Ebonite inlaid in silver. Aladdin and Lamp crest on top. Magic wand on each side. Beautiful to look at. Different from anything you have ever seen. Ladies and gentlemen both. Just send name, address and strip of paper the size of your finger. On arrival pay postman $1.49 and postage. Cash with Canadian or foreign orders.

$1.49 C. O. D.

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FOX CLIP

Holds any screw on tip of driver. By mail 10c.

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SM

Do You Know the Secret of Quality Reproduction?

"The Secret of Quality" tells you simply and concisely how to get the most out of your amplifier—how to get quality. This 96 page booklet is yours for the asking—it's free. Write for your copy.

SILVER-MARSHALL, INC., 840 W. Jackson Blvd., Chicago, U.S.A.

C-A DEVICES WILL SOLVE YOUR BEARING PROBLEMS!

PAT'D

The new C-A ADJUSTER BOLTS for connecting rod bearings keep your bearings always in perfect tension automatically. Installed in less time than fitting one bearing the old way and need no further attention. Made for most all makes of cars. MONEY BACK IF YOU AREN'T PERFECTLY SATISFIED. Specify make and model of car. Sent direct to you. Complete set for Fords, Chevrolets, etc. only .. **$2.75**

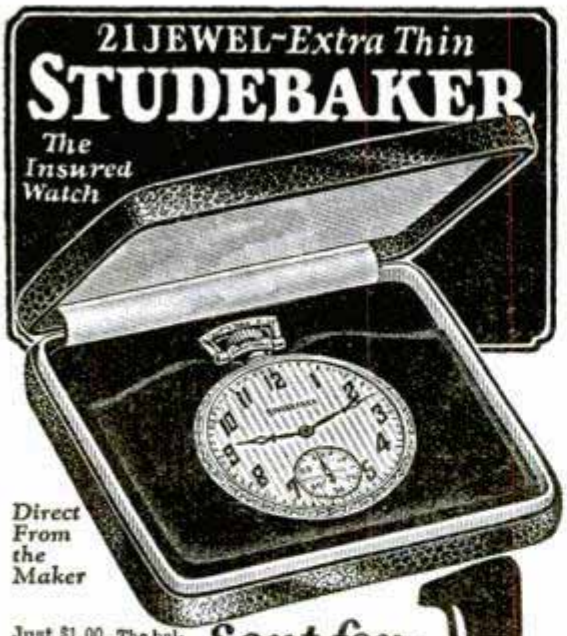
This automatic C-A crankshaft bearing permanently and automatically eliminates end-play in Ford and Chevrolet motors. Installed easily in a few minutes. Just remove crank-case cover—no need to "pull" the motor. Now priced extremely low. Install a C-A Automatic Bearing and dismiss your end-play worries. Direct by mail to you complete for **$2.75**

ADJUSTABLE BEARING COMPANY, Inc.
405 Virginia Avenue, INDIANAPOLIS, INDIANA

21 JEWEL-Extra Thin

STUDEBAKER

The Insured Watch



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Watch Chain FREE! For a limited time we are offering a beautiful Watch Chain free. This special offer will be sent to everyone who writes at once. Don't delay! Get this free chain offer today—while it lasts.

STUDEBAKER WATCH COMPANY

Directed by the Studebaker Family—known for three-quarters of a century of fair dealing

Dept. M907 **South Bend, Indiana**

Canadian Address: Windsor, Ont.

New Way Lacquer Spray

Smoother and Swifter Than Brushing

TYPE "B" Complete $3.45

For the easy and practical application of lacquer paints (Duco). A smooth, durable, glossy finish assured. Paint and refinish automobiles, furniture, screens, radiators, machinery, etc. Unlimited uses in any home, garage, paint shop. Well designed and built. Adjustable atomizing head affords a continuous spray. Useful for spraying oils, insecticides, etc.

Type "B"—as shown—complete with 1½' heavy duty pump, 8 ft. tubing—New Way dual top for use on either metal or glass containers. Glass furnished as standard—**$3.45.**

Type "B"—less foot pump. For your pump or air supply—**$2.45.**

Type "A"—Attached hand pump. Dual top. Easy clean glass container assures visibility. The sturdiest and finest hand spray—**$1.95.**

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TYPE "C" Complete $7.95

Type "C"—tank, pump and gauge only—**$4.95.**

Extra Glass or Metal Tanks with Air Tight Tops for Keeping Lacquers and Liquids Handy for Use.....25c

Send 10 cents postage for 3000 word booklet: "How To Do Lacquer."

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Headquarters for Lacquer Spraying Equipment.

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More Men to Earn

$25 to $75 Per Day

More men are needed right NOW to do the work Clarke FlorKraftsmen are doing. You don't need training—nor experience to make this big money. Others like you are making it. They acted. It's your turn now.

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Many who have seen our previous announcements are now making big money. The results are certain. It's a sure pay business. Get the facts—send the coupon. And do it *now*.

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POWERFUL - FAST CUTTING CLARKE VACUUM PORTABLE SANDER

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Now! HOUSEHOLD LACQUERING UNIT
You can easily dress up Your own Furniture, Screens, etc.

ONLY $15.00

FREE FREE
15-foot roll of Paasche Masking Tape with each Unit. Used for clean-cut color edges, shielding and stencilling.

It's Amazing how easy you can now paint with this Outfit

Brighten Up The Home
Until now the home owner had to be content with the old-style slow hand brush, with its unsightly laps and brush marks and uneven coverage. Now you can spray lacquers, paints, varnishes, enamels, shellacs and bronzes and make the work easier, look better and finished much faster. Now you can brighten up the home with your choice color schemes. This outfit has been tested and approved for home use and is the latest product of the world's largest manufacturer of airbrush equipment.

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With this unit you can obtain beautiful results, always smooth and uniform—secure any shade—spray intricate pieces as easily as flat surfaces—produce rich blends—veiling effects, and any finish, and as an aid in antiqueing furniture, this unit has no equal. Also don't overlook your auto—now you can keep it bright and new looking. Manual training classes of high schools everywhere find this an inexpensive unit and valuable in teaching this finishing method. Now do it better with a Paasche Spray Outfit.

THIS UNIT CONSISTS OF
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Paasche Airbrushes — Most Highly Perfected

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1949 Diversey Pkwy., CHICAGO, ILLS.

Also Finer Outfits for Artists and Larger Power Outfits for Painters and Manufacturers.
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A Boon To MOTORISTS
Amazing New
TROUBLE LIGHT!

GRIP-LITE has magnetized base. Sticks **tight** to any metallic surface. Ideal Auto "Trouble Light." Leaves both hands free! **Attached in 5 seconds.** No batteries to wear out. Gives **powerful** shielded light. Protected bulb. Also serves as emergency headlight, tail-light, or camping light.

"Stick It" Everywhere—Make $50-$100 Weekly
Makes sensational demonstration. Sells at sight. Every autoist, garage man, repairman a prospect. **Sells for only $3.00.** W. Miller: "Sold 6 in one hour!" C. H. Streator: "Selling 90 a week easy!" Many others cleaning up.

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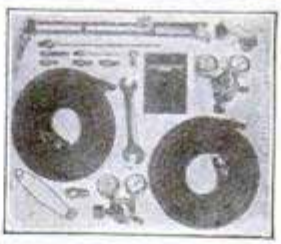

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"Interlox" MASTER SLIDE RULE
Speeds up all measuring. Slides in and out—no folding. Direct-reading for instant **inside** measurements, as well as outside. Any length, 2 to 8 ft., 20c lineal ft. If not at dealers, sent postpaid.

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Dealers and Agents: Write for attractive proposition.

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For Plating Nickel, Brass, Copper, Silver, Gold, etc.

Make $150 to $500 a Week
New Scientific Invention Enables Anyone
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This marvelous Invention enables anyone to NICKEL-PLATE anything—anywhere; in the Home, Garage, Office, Store or Shop—in fact, you can do all the NICKEL-PLATING on any automobile with the ALADDIN ELECTRO PORTABLE OUTFIT in a very short time—without removing any of the parts. This interests every auto owner (and others) because you can **SEE THE NICKEL FLOW** NOW take the Plater to the job instead of taking the job to the Plater. This offers wonderful ECONOMY to users and BIG MONEY-MAKING possibilities to AGENTS. Be the first in your locality. *WRITE FOR FREE BOOKLET.*

Introductory Offer **$6.50** Plus Postage

P. J. F. BATENBURG Dept. 32 RACINE, WISCONSIN —AGENTS— WANTED EVERYWHERE

MADE $1200.00 NET PROFIT IN 90 DAYS

You Can Do It Too FREE Book Tells How-

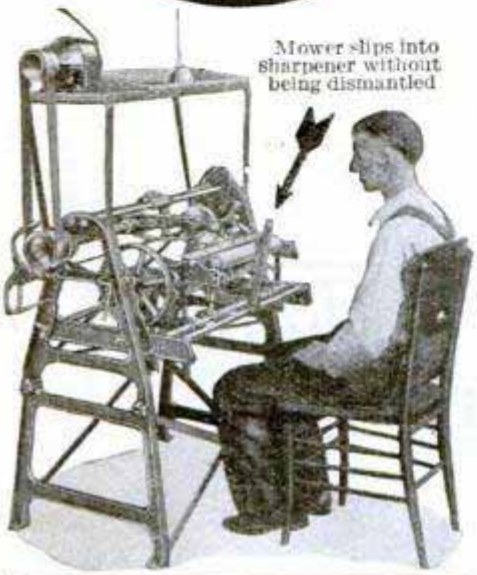
SEND FOR THIS BOOK

Here's Your Chance!

The big opportunity you've always wanted—to make extra money, BIG MONEY, in your spare time, at home. W. T. Moore, Twin Falls, Idaho, made a net profit of $1200 in 90 days. You can do it too—turn every spare hour into $4 to $6 profit with the

IDEAL LAWN MOWER SHARPENER

You, too, can make yourself independent, build a permanent, honorable, big-paying business with this "Ideal" Grinder—a wonderfully simple machine that sharpens all makes of lawn mowers perfectly, scientifically, without taking the mowers apart. Just pick up the mower, set it in the "Ideal," make a few simple adjustments and proceed to sharpen. In 15 minutes the mower is ready for the lawn, and you have made $1.50 to $2.00—depending on the charge you fix.



Mower slips into sharpener without being dismantled

Man, It's Amazing How Easy it is to make big money with the "Ideal." Anyone can do it! H. J. Nulick, El Dorado, Kans., turned his grinder business over to his 14 year old son.

$2100 Last Season
W. F. Kendt, Buffalo, writes: "I sharpened 994 lawn mowers last season and the receipts were nearly $2100—not bad for a side line."

Hundreds of Dull Mowers in your locality are waiting to be sharpened. No town too small. R. S. Newcomer, Vinton, Ia., writes: "People come for miles around and other towns to get their mowers ground." Your customers stay with you, too. The "Ideal" sharpens mowers to razor edge. Owners are delighted; tell their friends; your business grows by leaps and bounds.

You Make Money Right Away Geo. E. Kearney, Stillwater, Minn., writes: "We set the machine up 2 weeks ago Friday; since that time have sharpened 102 mowers." That's close to $200 in Kearney's pocket for 2 weeks' work!

This Is Your Chance, Man! Make Us Prove It
Our FREE BOOK, "Let George Say It," contains proof of what we say. Send today for it.

The Fate-Root-Heath Co.
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SIGN AND MAIL THIS TODAY

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Name.....

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The International Motor Saw

does every sawing job from straight cutting to intricate scroll and design work; crosscuts, rips, miters, bevels, inside and outside jig sawing and scroll cutting. One saw instead of several.

Write for full description. **Dept. S. The International Stamping Co., 400 N. Leavitt St., Chicago, Ill.**

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Anyone can trim or bob hair, shorten bangs, clip neck or underarms in a shape almost impossible with hand clippers or shears. Operates on direct and alternating current. Will not clog or cut the skin, and cuts as cleanly as a razor. Thousands in use. Rigidly guaranteed.

Fits Any Light Socket

TEN DAYS' FREE TRIAL

If your hardware or electrical dealer can't supply you, write for interesting booklet, or order from this ad. Send no money—pay postman $8.75. Return it in ten days if not satisfactory. State whether 110, 220 or 32 volt current is used.

Dealers and Representatives Wanted

Belle City Appliance Co., 1022 12th St., Racine, Wis.

KING

"King Bugle Best" Says Expert

Band Master R. E. McGeary, 1st Battalion, New York City, after testing all American and foreign made bugles, wrote Scout Headquarters that the King Official Boy Scout Bugle was "far and away the best instrument of those tested."

The King Bugle has highly polished brass finish, silver plated mouthpiece. It's the finest bugle made.

Get in the Band!

Learn to play a band instrument. Start now with a King, the choice of both professionals and leading amateurs.

King Band Instruments will help you to learn faster and play better. Our liberal payment terms put these fine instruments within the reach of all. Send coupon for literature, prices, terms, etc.

THE H. N. WHITE CO.
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Please send me free copy of "The White Way" Magazine and your Handy Reference Catalog. (Check, below, instrument preferred.)

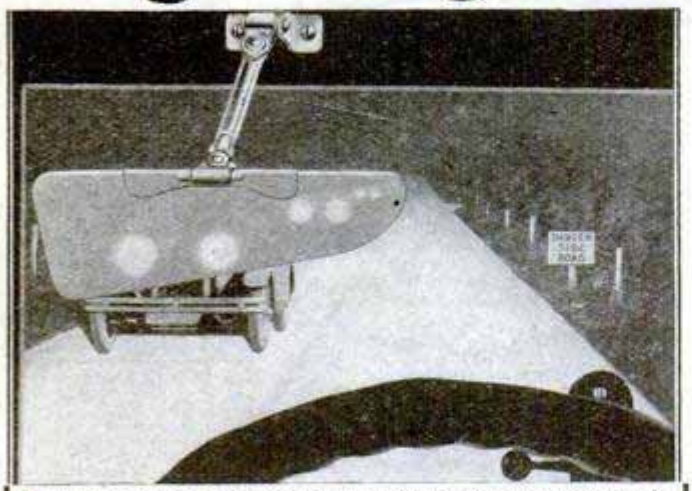
Name..... Age.....

Address.....

City..... State.....

☐ Saxophone ☐ Trumpet ☐ Trombone ☐ Alto
☐ French Horn ☐ Baritone ☐ Bass ☐ Bugle

Kills Glare of Bright Lights



The amazing new Liberty Glare Shield actually dims the bright lights of approaching cars so perfectly that it is as safe to drive at night as in the day. It is adjustable to all angles and a touch of the finger operates it. Gives perfect protection against the sun as well as bright lights. When not in use it can be folded up against the roof of the car. It is scientifically shaped and placed. Statistics show that thousands have lost their lives in auto accidents due to glaring headlights. The Liberty Glare Shield banishes this danger and makes driving a safe pleasure.

$5.00 AN HOUR TO MEN WHO WILL HELP INTRODUCE IT

Men are needed in every locality to take care of local business. The money making possibilities are tremendous. Every car owner is a prospect. Full time or part time workers will find this the biggest money maker they ever handled. Sales experience is absolutely unnecessary. The Liberty Glare Shield and our sales instructions do the selling for you.

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Our workers are furnished with a Liberty Glare Shield for their own cars so that they will be able to make demonstrations. Send for full particulars of our sales proposition and free offer.

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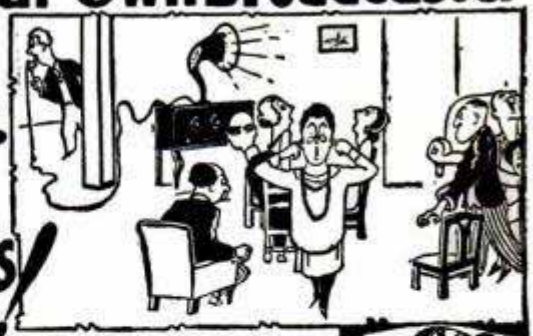
Be Your Own Broadcaster



Fool Your Friends!

THE SKY IS THE LIMIT

A NEW IDEA FOR A RADIO PARTY!

The mystic Home Broadcaster is attached to any radio set in a jiffy. No skill required. Stretch long extension cord into another room or closet, press the switch button on the microphone which automatically cuts off radio reception and YOU BEGIN TO BROADCAST: THEN THE FUN BEGINS! Sing—Joke—Play—*The sky is the limit!* Release the button and radio reception comes through once more. Slip a Home Broadcaster in your pocket when you go to the next radio party and see what happens.

SEND NO MONEY. Pay postman $4.95 plus postage for the Home Broadcaster outfit consisting of Microphone, Special extension cord and adaptor plug. State whether you want the Type U. X. or Type A. C. Money Back Guaranteed.

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USE ENGINITE FOR YOUR MOTOR COOLING SYSTEM

The wonder fluid. Applied through radiator. Gives pleasure to motorists. Prevents overheating. Removes rust, scale and corrosion scientifically. SAVES GAS AND OIL. ADDS PEP AND LIFE TO MOTOR. Non-injurious, non-inflammable. It is a preservative. Four treatments in one can, price $1.00 (West of Rockies 25 cents extra). Sent C. O. D. Postage prepaid. Guaranteed or money refunded. Reg. at U. S. patent office. Dealers write for proposition.

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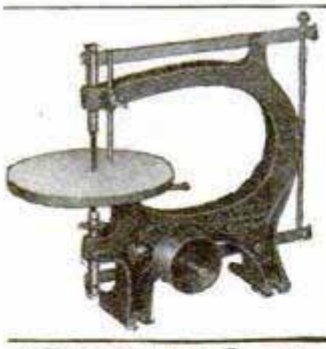

It's Easy to Build Things

You can perform every woodworking operation with greater speed, accuracy and economy on Boice-Crane's

Universal Jig Saw

Table 8 in. dia. tilts 45 deg. both ways. Saw-to-frame 10 in. Vertical stroke 1½ in. Uses blades ⅜ in. to ⅜ in. wide. Bronze bearings. Speed 650 R. P. M. Height 14 in. Sold with or without motor.

Universal Handisaw

Table 15 in. x 17 in. tilts 45 deg. Elevates for grooving. Swings 9 in. saw, cuts 2½ in. stock. Insert takes 6 in. x 1 in. dado head, cope heads and 8 in. sand disc. 2 in. Jointer attachment. Guides always remain parallel to saw regardless of elevation or tilt of table. No other saw has this feature. Sold with or without motor and base.

Send 10c for new catalog "B" describing and illustrating Boice-Crane's complete line of band saws, jig saws, circular saws, mortisers, jointers, lathes and the Boice Home Workshop.

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Safety Grass Cutter

Newest Invention—Eliminates the old fashioned "*Always Dull*" Sickle—No more Expense and Bother for sharpening and grinding. The Safety Grass Cutter is always sharp—Uses your old Razor Blades—Cuts grass 100% faster. Handle is adjustable to any convenient cutting angle. Blades can be instantly replaced. Absolutely safe to leave around the house—folds up like a jack knife, hiding the exposed cutting edge. Guaranteed never to get out of order. SEND NO MONEY. Pay postman $1.00 plus postage on delivery. **Elba Products Mfg. Co., Dept. P.M., 726 Atlantic Ave., Brooklyn, N.Y.**

Use Your Old Razor Blades

Makes Grass Cutting a Pleasure

NO TENTS to PITCH!

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Jump Wire - 3 ft. Long

$1.00 Prepaid Anywhere

Try It LATEST 1928 METHOD FOR SOLDERING

ARKO SOLDERING TOOL

works from any storage battery—heats instantly—can be used with Kester acid core or rosin core solder. Every mechanic is delighted with this new time saver. Sent with sample of solder prepaid in U. S. A. **Price $1.00.** Worth the price the first time used. Should be in the tool boxes of every Radio and Auto owner—connect to any live wire on the Auto or Radio with clips furnished. Can be used as a Cigar, Pipe or Cigarette Lighter. Keep it in your car.

ARKO MFG. CO., 180 PARKWAY, WINCHESTER, MASS.

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Big Profits Roll in!

Over $10,000 a Year Income

WHAT Frank Lockhart, the daring 25-year-old driver from Indianapolis, did at the International Speed Trials at Daytona Beach, Florida, is now a matter of automotive history. Think of it! Speed at the rate of 230 miles an hour on Dickinson Cord Tires. Not tires specially made for the occasion, but selected by Lockhart from our regular stock, after severe competitive tests with many other makes, and costing less than $20.00 each.

Two hundred and thirty miles *an hour!* under heavy "load" and excessive "thrust" without a single break and with all the original air in them even after the dramatic climax which broke the axle, crumpled the fenders and buckled the wheels. Only such sturdy and scientific construction as Dickinson Cord Tires afford could stand such a strain.

These are the tires that our Salesmen-Agents are finding a ready sale for. Tires which the press, all over the country, have commented on as marking a new era in Automotive Progress.

Every Dickinson Tire is Perfect and a Racing Tire. Its cabled-cord construction, correct motor-traction principles, resiliency, quick "get-a-way" and absence of "tire-lag" make it a tire for the classes, those who want only the best. Yet it costs no more than the ordinary tire; practically pays for itself, as savings in fuel consumption range from 10% to 17%.

Whether you have ever sold before or not you can easily make $40.00 a day selling Dickinson Cord Tires because they render Service, deliver Speed, provide Comfort and supply Economy. Customer satisfaction and repeat sales are assured. Every tire guaranteed against all road hazards regardless of mileage.

Write today for Information about Exclusive Territory still open. Dept. 59.

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J. G. FEIST, *President*

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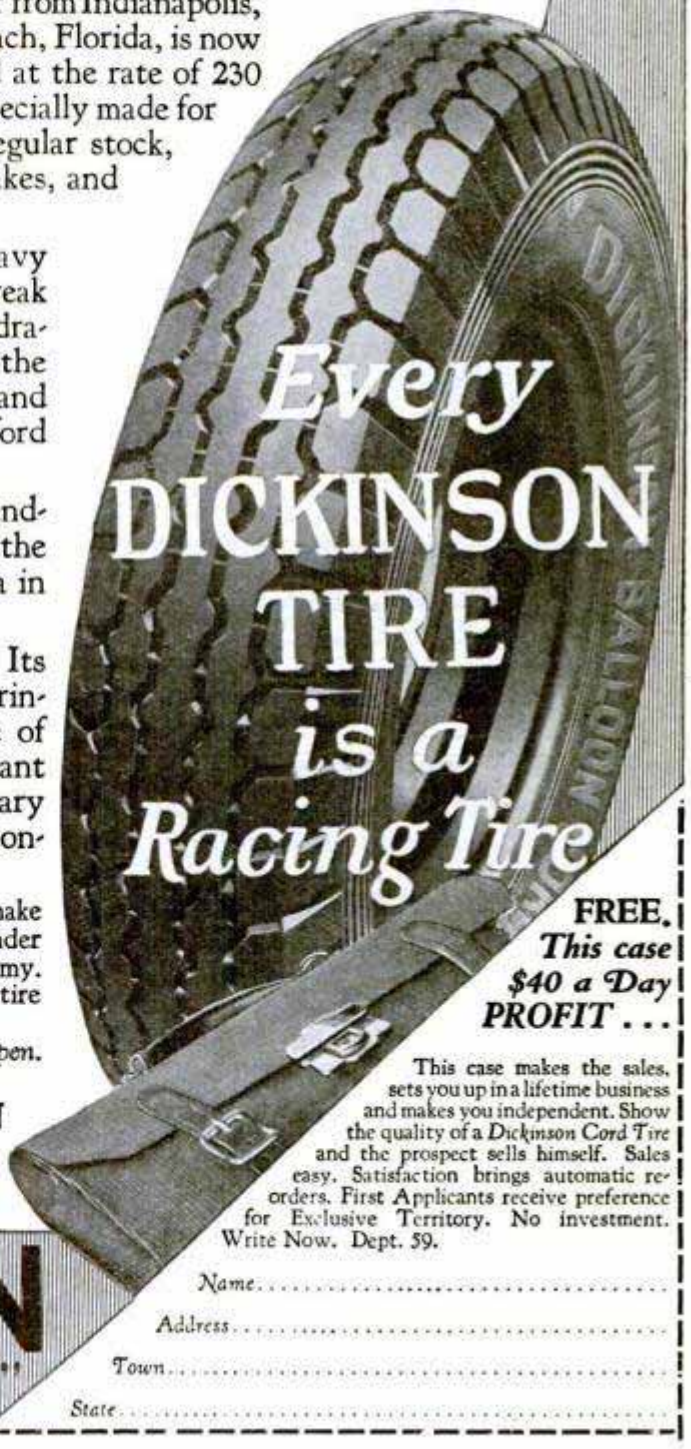
Address Nearest Branch



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This case $40 a Day PROFIT . . .

This case makes the sales, sets you up in a lifetime business and makes you independent. Show the quality of a *Dickinson Cord Tire* and the prospect sells himself. Sales easy. Satisfaction brings automatic re-orders. First Applicants receive preference for Exclusive Territory. No investment. Write Now. Dept. 59.

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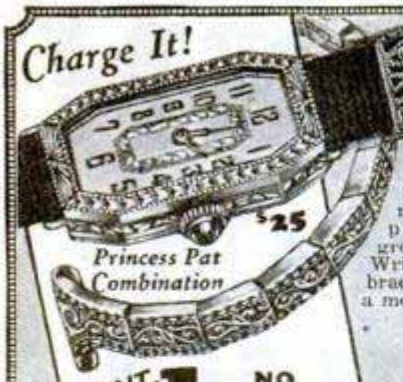
"The World's Perfect Tire"

Charge It!



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Only the finest, and a full year to pay—Send $1 with order and your choice comes to you prepaid—no C. O. D. to pay on arrival.

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After examination and 10 day free trial, pay balance in 12 equal monthly payments. No interest. No extras. **All transactions strictly confidential.** You take no risk—satisfaction absolutely guaranteed or money back.

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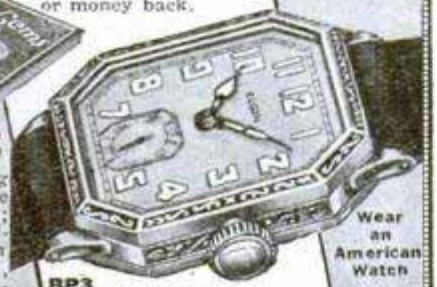
New catalog of genuine diamonds; Bulova, Elgin, Waltham, Hamilton, Howard, Illinois watches; fine jewelry. Write for your copy now.



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Estab. 1895

BP3 Elgin or Waltham movement, hand engraved 20 year guaranteed gold filled case. $2.12 a month. $26.50

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FREE TRIAL

TURN YOUR HOBBY INTO INCOME!

No trick at all with this amazingly low price Woodworker, which you may try, and pay for, on terms, to turn idle hours into profit. Does 20 woodworking operations. Ideal size, capacity for shop, home or the job. Economical.

COMPLETELY EQUIPPED!

Comes complete with 8-in. Cross Cut, 8-in. Rip Saw; 12-in. Band Saw; Jointer, Lathe, Borer, Sander, Guides, Electric Motor. Investigate it!

FREE Working Drawings of 60 Items You Can Make with Saw

SEND FOR FULL DETAILS!

A. S. ALOE CO. 1832 Olive St., St. Louis, Mo.

Without obligation, send me details on the Woodworder, and the Free Trial and Easy Terms Plan.

NAME.....

ADDRESS.....

Yes —hand sanding is made 5 times faster with the

TAKE-ABOUT Sander

The only hand belt surfacing machine. Now making money for thousands of carpenters, builders and woodworkers. Quick, easy belt change. Flexible pads for curved surfaces. Finish unequalled by any machine, due to belt principle. Plug in light socket, let the belt work—you merely guide it. **Pays for itself.**

Write for further details

2 models Take-About $85.00 Super Take-About $125.00

The Porter-Cable Machine Co.
1704-10 N. Salina St., SYRACUSE, N. Y.

AGENTS! EXPERIENCE UNNECESSARY

AMAZING DISCOVERY ABOLISHES METAL POLISH

Science has finally produced it. An instantaneous metal cleaner—neither sloppy liquid nor messy paste. Dry magic floss. Touch it to nickel, copper or brass. The metal shines bright and clean *instantly*. No hard rubbing! Lightning Silver Cloth does same for Silverware.

No liquid. Lightning Polishing Cloth is approved by Good Housekeeping Institute.

Agents making up to $30 a day!

Imagine! Touch tarnished articles with a Lightning Polishing Cloth or Floss and you make them bright as new. Demonstrations positively astonish! *Every* one a sale! Agents collect *real money* on *every* call.

Makes a Sensational Demonstration! **Everybody Buys These Products.** Housewives buy the Lightning Silver Cloth. Autoists buy Lightning Polishing *Floss*. Sell to stores and offices in big quantities. Nothing else like them. Sure big, quick MONEY GETTERS.

Sample Free! Exclusive territory. Real cooperation. Triple profit. Answer this ad at once. Make big money. Easy! Quick! Don't delay. Write NOW! FREE test sample and proposition by return mail.

A. LIGHTNING PRODUCTS CORP., 416 So. Dearborn St., Chicago

New Auto Light Sticks on Car

Pocket $20 Daily!

You can easily make this money acting as our local representative for Stick-A-Lite, greatest night auto trouble light for changing tires or fixing engine. Sticks anywhere on iron or steel. Spotlight and tourist camp light, too. Easy for you to sell 5 or 6 a day. Just show it to your friends and neighbors. Hunt made $270 in 9 days! School boy sold 35 one afternoon.

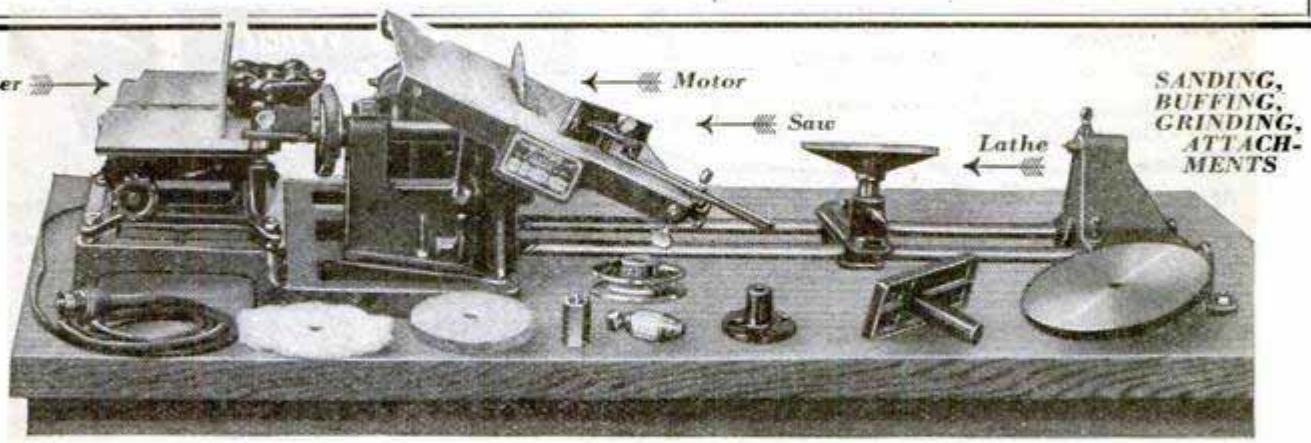
Get A Stick-A-Lite

Write for complete details FREE. Better still, have us send you a complete Stick-A-Lite Demonstrating Outfit C. O. D. for $2.00. Money refunded, less postage if returned within 10 days. Write at once!

PREMIER ELECTRIC COMPANY
3870 Ravenswood Ave. Chicago, Ill.

WORKACE ELECTRIC Woodworker

Complete Outfit Including Planer, Saw, Lathe and Electric Motor and Many Useful Attachments



FAST — ACCURATE — COMPLETE

Every kind of woodworking operation

This is a COMPLETE All-Electric Shop. It costs a lot less than most other outfits—and for every dollar you pay, you're getting THE BIGGEST VALUE—you can't beat it, anywhere! You can prove every word of this by actually *using* the Workace Woodworker at home or in business. You'll find it fast and accurate—you can perform every kind of woodworking operation, make furniture or other useful and decorative things for your own home or for profit. Planing, sawing, turning, drilling, grinding, sanding or buffing—it is all the same to the Workace Woodworker. You can save time on every operation, do the work better and cleaner, too!

Amazing low price . . . . includes everything

That's because all the modern up-to-date manufacturing facilities of the J. D. Wallace Company, suppliers of standard woodworking equipment for industrial and commercial uses, are utilized to produce the Workace Woodworker. Materials and workmanship are 100% and the designing of the Workace is strictly professional. Woodworking plants, pattern shops, carpenter and cabinet shops all over the world use Wallace equipment. It's the kind of machinery you want—you can't afford to own any other.

Become an expert woodworker

There is no end to the number of useful and decorative things you can make with the Workace. Tables, chairs, footstools, screens, lamps, lattices, fences, cabinets, doll houses, bookcases, chests—you'll soon become an expert. Woodworking is the greatest hobby a man can have—hundreds turn it to profit too.

The Workace Woodworker has power, strength and capacity to handle quickly and economically any job you'll ever want to do . . . mitering, tapering, rabbeting, beveling, slotting, turning, crosscutting, ripping—anything. Every unit works from the motor. The parts are sturdy and well-fashioned. The regular Wallace UNQUALIFIED GUARANTEE assures replacement of defective parts for one year.

$89

Includes all this:

- **4″ Planer**
- **8″ Circular Saw**
- **6″ x 36″ Lathe**
- **8″ Disc Sander**
- **6″ Buffing Wheel**
- **5″ Emery Grinder**
- **¼″ Drill Chuck**
- **¼″ H. P. G. E. Motor, 110 Volt, A. C., 60 cycle**

Endless V Belt, two 4″ and one 2¼″ V Belt Pulleys, Cast Iron Sub Base and 10 ft. Cable with separable Plug.

EASY TERMS

Get the outfit right away

SEND TODAY

The terms are all in your favor. In fact, this whole advertisement, the merchandise offered and the easy method of purchasing is new and revolutionary.

A small down payment brings the complete Workace All-Electric Woodworker ready to set up and use right away. The monthly payments are so small you'll scarcely miss them. Many pay for their Workace Shop out of profits from the work it does. So can you.

Get it—use it—you'll find the Workace Electric Woodworker the best investment you ever made. Send this coupon now—today—and we'll see that you get full details and a complete description right away!

Wallace
PORTABLE MACHINES

The name Wallace stands for leadership in the commercial woodworking machinery field, not only in the U. S. but all over the world. You can't go wrong on any machine that's made by the J. D. Wallace Company, Adams and California Ave., Chicago, Ill.

J. D. Wallace & Co.,
Adams St. and California Ave.,
Chicago, Illinois.

That Workace Electric Woodworker sure looks good to me. I want to know ALL about it, including your easy terms, right away.

Name.....

Address.....

City.....State.....

RUSH-Absolutely FREE

☐ "The World's Most Useful Small Tool" and the 125-Picture PLIERENCH Circular.

Name.....
R. F. D.
No., St.....
P. O.
City.....
☐ Am interested in Big Factory Repr. Proposition
Stt.....

---CLIP HERE---

Mail Today to THE FLASH SALES CORP'N
PF-4809 N. Ashland Ave. CHICAGO, ILL.

FREE to First 1000 Readers mailing above coupon—an E-F ANGLE Screwdriver—

Of tempered crucible Spring steel, it has 7 powerful driving edges for large and small screws and 101 other uses—works under obstructions where others won't. Carries like a small pocket knife—more often useful and valuable.

Also FREE—the "$5,000" Circular— giving amazing 125-Picture story of

with its 1-TON Power-Gear it Out-grips a 40-Pound Vise! The "hand-grip" of a tiny Rubber band holds a Bearing Ball—the Hardest-to-hold thing known—against a 300-lb. Pull!

It is an Automatic LOCK-Grip Ratchet WRENCH—Speed-VISE—Parallel PLIERS and More

No. 3—for all Wire, chain, spring-making, fence work. No. 2—for all Pipe work, "chewed" nuts in tight places, etc.
No. 1—Universal—for ALL pliers, Nut Wrench, Vise and clamp, Spring-making Work, etc.

EIFEL-FLASH PLIERENCH KIT

You get the amazingly Quicker, Better, Easier, Universal Tool Service of Nos. 1, 2 and 3—CONVERTIBLE in 1-5 SECOND—in this New 24-Ounce Master Tool Kit—for the PRICE OF ONE GOOD TOOL; yet, it Does the Work of the best other tools Weighing 60 pounds and Costing $50.00!

HUNDREDS OF THOUSANDS of men and Women are using these wonder Kits to make their Homes and Estates more comfortable—Farms, Shops, etc., more profitable; to get more and better service from Automobiles and all mechanical devices; with an enormous saving in money, time and energy! Used by the U. S. Army and Navy. **Just try a** PlieRench **Kit once** and you would no more go back to other tools than you would to the ancient Ox-cart.

With each Kit is a 64-page Manual of Mechanics

A GUARANTEED SUPER-QUALITY PRODUCT

If interested in Permanent income of $75 to $200 Weekly—as Factory Representative (full or part time) mark coupon!

Mail the Valuable Coupon above—NOW!

Better than a Brush

46 handy home uses

Ideal for applying brushing Duco, or any brushing lacquer to your car, furniture, screens, etc. Less work, less time; richer finishes. Anyone can do it. Change tanks—and oil springs, spray plants, etc. Automatic continuous spray action; equal to outfits at three times its price.

Send check or money order—we pay postage, anywhere in U. S. or Canada.

LACQUER-WELL SPRAYER

Challenger Model, complete as shown	$3.45
Same less pump, ready to connect with any tire pump	2.25
Master Model, larger throughout	4.50
Same less pump, ready to connect with any tire pump	2.75
Spray Gun Model	2.50
Extra tanks with screw tops	25c each

The Lacquer-Well Spray Co., Dept. R, 2012 E. 105th St., Cleveland, O.

$40 PROFIT the First DAY

That's What Bill Murphy Made Selling this

Perfo-Siphon

"It perforates the cap"

Dealers! Perfo-Siphon sells on sight from attractive counter display. Write for prices.

The fastest selling novelty of the year

Others say: "Sold 9 doz. the first day". "Walked 3 blocks and sold 1 doz". "Sold 600 order on my first call". "Sold 3 doz. my first hour out". So it goes!

Everyone Wants This

New Gas-Tight Siphon

Perfect way to serve ginger ale and all carbonated beverages. Put on without removing crown cap, it perforates cap. No gas is lost. Keeps the contents from going stale and flat. Keeps unused portion full of sparkle for days. Nothing like it. Sells on sight!

WRITE! or Mail $1 for Sample

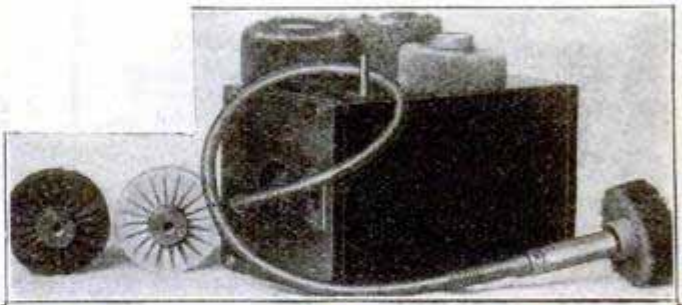
You'll want one for your own use anyway. Just send dollar bill with name and address and ask for special offer to agents. Or write for full details.

Vaughan Novelty Mfg. Co.
Dept. A-935 **3215 Carroll Ave., Chicago**

GIANT TELESCOPE ONLY $1.85

Over 3 ft. long; brass bound; powerful lenses. See distant objects. Loads of fun! Carrying Case **FREE. SEND NO MONEY;** Pay Postman only $1.85 and postage. (Or send $1.85 and we pay postage.) Money back guarantee.
FERRY & CO. **Dept. 1777** **CHICAGO**

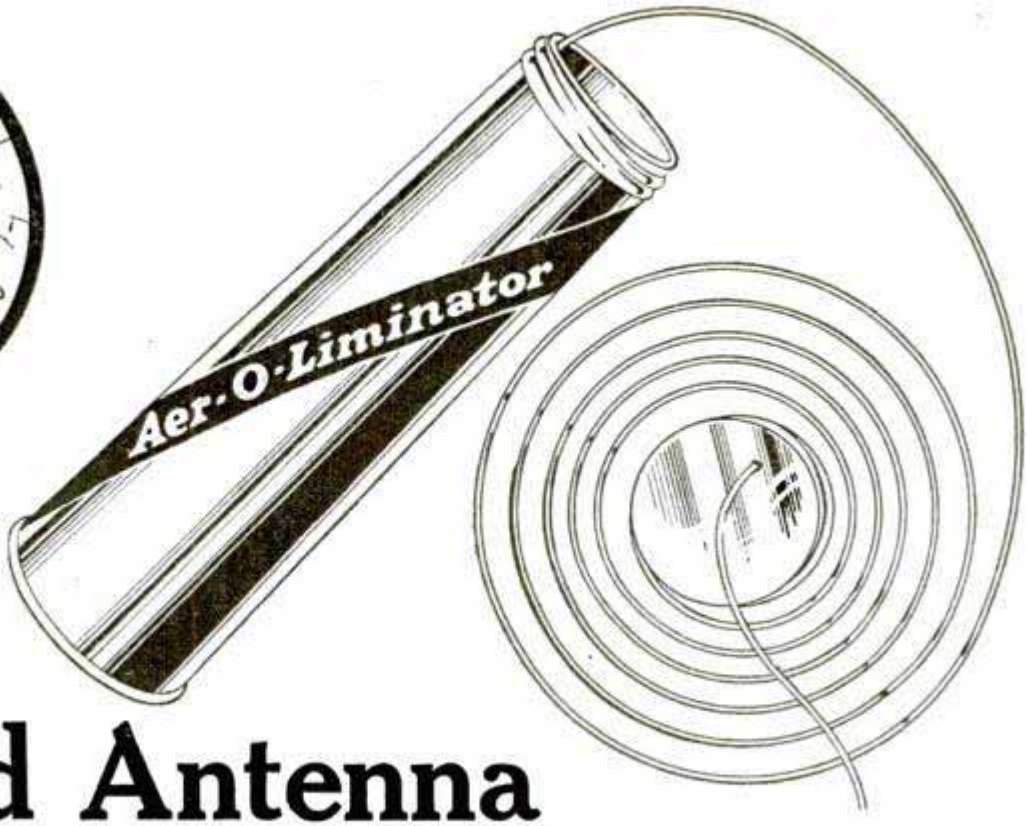
Let us recommend the best books to study on any subject. Popular Mechanics Press, Chicago, Illinois.



Electrify Your Shoe Shining Stand

Give a better shine in half the time. We also make complete stands, with power brushes, folding footrests, automatic counter and many other features. Time payments if desired.

HASTY-JOHNSON, Inc., ELGIN, ILL.



Astounding Successful

Ground Antenna

Gets Winter Reception in Summer!

Read this Proof

From 208 Golf Terrace, Wilmette, Ill.

"Your Aer-O-Liminator works fine. You could hardly believe what a difference it makes in the clearness and tone of my set. It certainly seems to take out nearly all the static and power noises that have been bothering me, too.

"Mine is only a three tube set, but with the Aer-O-Liminator I can pick up outside stations every night, clear and with volume. You must be right about the static-free ground waves."

L. Beauvais.

From Kimberly Radio Corp., 328 N. Michigan Ave., Chicago.

"We have used the Aer-O-Liminator with great satisfaction. It removes the necessity of the unsightly outside aerial and improves reception materially. It reduces static and outside interference, and produces very clear tones on distant stations, with good volume. It increases selectivity greatly. We would recommend it to anyone for the best results on his set."

P. R. Kimberly, President.

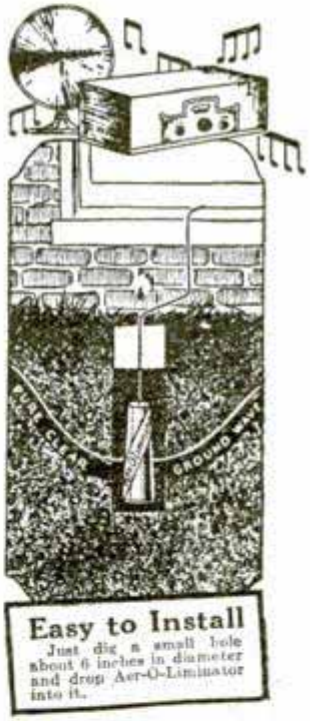
Clearer Ground Wave Reception Allows Greater Distance

Hundreds of satisfied users of the sensational Ground Antenna—Aer-O-Liminator—are wondering how they ever got along without it. All over the country radio owners are finding marvelous satisfaction in freedom from static and noise interference. This revolutionary improvement of reception comes from hooking your receiver to Ground Wave Reception. Radio engineers tell you that the broadcast wave through the ground is in most cases almost static-free and with rare exception carries no noise interference.

The rapidly increasing army of Aer-O-Liminator owners also enjoy and appreciate the natural human tone and clarity of this Ground Wave Reception. If you haven't tried it you can't imagine the difference!

Another advantage users have found with Aer-O-Liminator is the surprising D X they get. Distant stations formerly drowned out by static or noise interference of air waves now come in clear as a bell. Selectivity is improved because, with pure clear Ground Wave Reception, you can pick up and log signals that before were lost in the jumble of shrieks and howls so common in D X reception through air waves.

You shouldn't deprive yourself of the new thrill of pure, clear ground wave reception a day longer than necessary. We let you prove it for yourself.



Easy to Install

Just dig a small hole about 6 inches in diameter and drop Aer-O-Liminator into it.

FREE TRIAL

Make this thrilling test at our risk!

Install an Aer-O-Liminator (Ground Antenna). Leave your old overhead aerial up. Try out on a night when static is bad. If you do not get a wonderful improvement in freedom from static, greater selectivity and clear, sweet tone without interfering noises, if you can't get good reception on stations that are drowned out by static on your old aerial, you need not pay us a red cent for this test! Send coupon at once for scientific explanation of Aer-O-Liminator (Ground Antenna), proof of performance and our conclusive iron-bound guarantee, and remarkable Free Trial Offer—Mail Coupon TODAY!

Aer-O-Liminator (Ground Antenna)

Passed by the National Board of Fire Underwriters. Meets requirements of the National Electrical Code.

Endorsed by Foremost Engineers and Dealers.

Curtan Mfg. Company

Dept. 805-H 154 E. Erie St. Chicago, Ill.

Rush This Important Coupon

Curtan Mfg. Company,
154 E. Erie St., Dept. 805-H, Chicago, Ill.

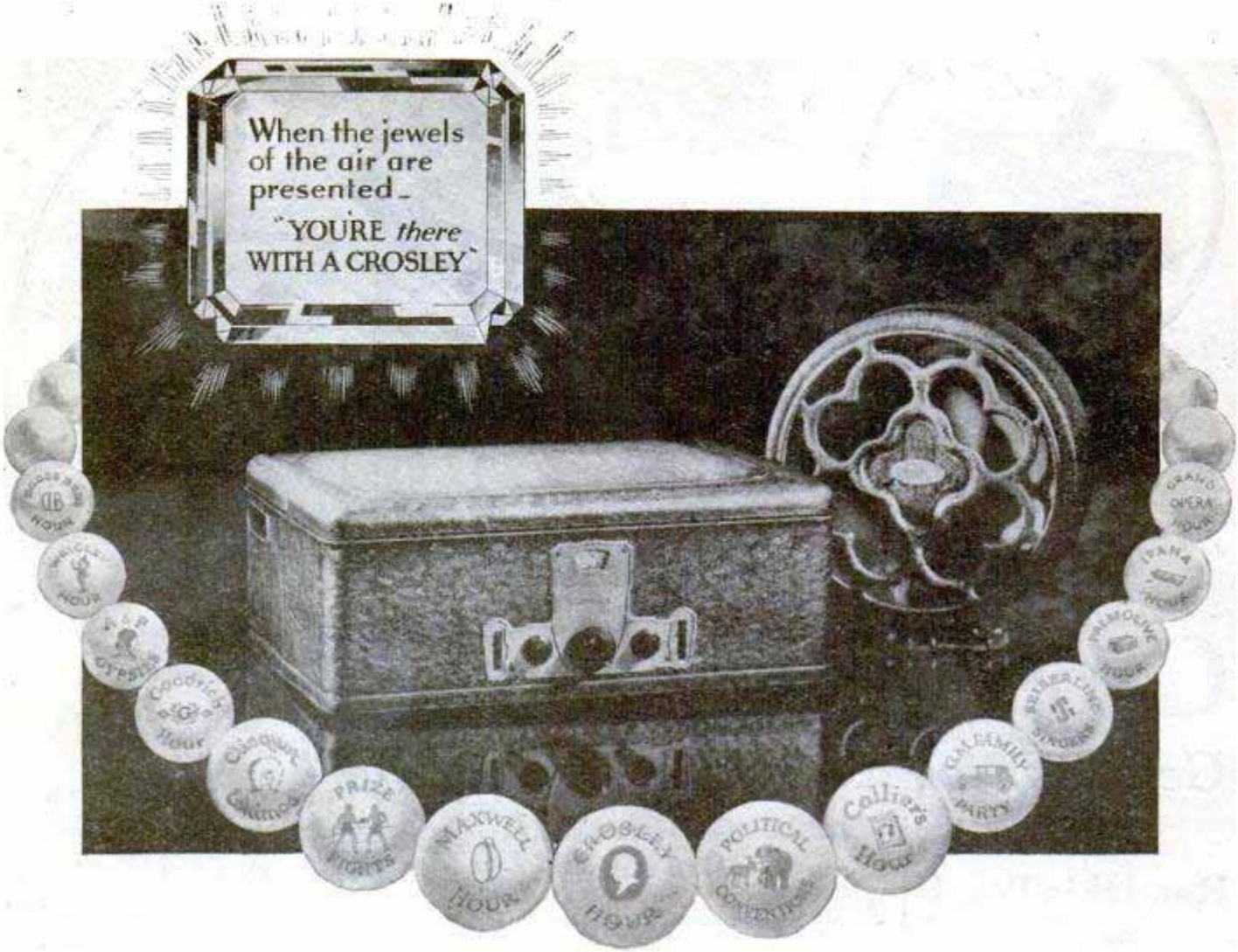
Please send me at once complete description of Aer-O-Liminator, with details of guarantee, Scientific Proof, and Free Trial Offer.

Name.....

Address.....

City.....

State.....



The New CROSLEY JEWELBOX

$95
WITHOUT TUBES

Take advantage of the most amazing offer ever made in all Radio History!

Try this remarkable new Crosley Radio with Crosley new type D Musicone without cost or obligation. Just phone a Crosley dealer—tell him you want to test the new Crosley Jewelbox.

Home is really the place to buy radio!

Home is where you can decide leisurely and surely. Crosley dealers are authorized to home demonstrate this new radio. Antenna unnecessary for such demonstrations—30 feet of wire on the floor of the room will do nicely.

Put the Jewelbox to any test!

Compare it with your old set. Try it with any other! Learn what radio reception *can* be. Note how easy it will be to break through any surrounding wall of local stations—to bring in distant programs quickly, clearly and in full volume. Be sure you test the Jewelbox with the Crosley new type D Musicone that you may fully realize, if you own an old set or have not heard a Crosley, how far radio has progressed.

Remember—you do this all in your own home—at no cost and no obligation to you!

Try it in your home—that's the only way to buy a Radio!

Every Crosley Dealer is now authorized to give you this FREE trial!

THE CROSLEY RADIO CORPORATION

Powel Crosley, Jr., *Pres.*, Cincinnati, Ohio

Licensed only for Radio Amateur, Experimental and Broadcast Reception. Montana, Wyoming, Colorado, New Mexico and West prices slightly higher.

NEUTRODYNE

The Musicone finished to match the Jewelbox, $15

The new Crosley Jewelbox is self-contained to operate from light socket.

All in one beautiful case. Add tubes and it's ready to operate! It is powerful. Supplying 180 volts to power output tube it gives full undistorted volume. Other sets supplying 110 to 135 volts result in poor quality, distortion and less volume.

The Acuminators, an exclusive Crosley feature, enable you to tune sharply on distant stations increasing signal strength and volume to a surprising degree.

The new Crosley Jewelbox is up-to-date.

The dial is illuminated—a modern necessary feature. The set is completely shielded as all high grade radios should be. The rich brown finish high-lighted with gold makes it an ornament to grace the finest room. The beauty of the Jewelbox will charm you.

The price of the new Jewelbox is a triumph of manufacturing genius!

Crosley engineers designed this new Crosley Jewelbox under explicit instructions to make first a perfect radio. If the production of their final design had been limited to a few hundred, only wealthy persons could have afforded them. But with efficient Crosley production methods, facilities to manufacture parts in million quantities and a faith in the enormous demand such values would create, this splendid radio receiver is priced at $95.

Write Dept. 15 for literature.

POPULAR MECHANICS PRESS, PRINTED IN U. S. A.

Here's the new improved SUBANTENNA

Easily Installed in a Few Minutes — Guaranteed to Bring in Loud, Clear DX Right Through Summer Static

Here it is—the new, improved and perfected SUBANTENNA—even better than its amazingly efficient predecessor which brought forth volumes of enthusiastic praise from thousands of critical fans. Now it's ready—the new SUBANTENNA—ready to prove its DX ability—ready to challenge any type of loop or up-in-the-air aerial—ready to challenge those who have tried to produce an underground antenna of comparable efficiency, but who can't because the features of the new SUBANTENNA which make it so superior to anything else are patented. In short, here's the ideal antenna Loud, clear DX regardless of the season—regardless of weather—regardless of how much static there is in the air.

How This Amazing New Underground Antenna Works

It is a known fact that radio waves travel through the ground just as they do thru the air. Ground waves, however are much clearer than air waves, because air waves are more or less cut-up with static and other disturbances, while the ground is practically free of all such interference. The new, improved Subancenna — a real, scientific device completely enclosed in a small, compact sealed and moisture-proof can, is buried in the ground in a vertical position. It intercepts the clear, strong, static-free ground waves and sends them up to the receiver via a shielded cable. Comparison, station for station, of reception taken from the ground with a Subantenna and reception obtained in any other way, instantly establishes the worth of this great new device.

Tested and Proved Tremendously Successful on Every Type of Set

Subantenna was put to countless tests before being offered to you. It was tried out on as many types of receivers as it was possible to obtain. In every test the new, improved Subantenna exceeded all previous standards for antenna performance. It is sure to work on *your* set. It is certain to so greatly improve your reception and to so greatly increase your radio enjoyment that you would not part with this new, better antenna for twice its price if you could not get another.

FREE TRIAL!

We want you to install the new, improved SUBANTENNA. Installation takes only 5 minutes. We want you to try it on your own set — **entirely at our risk!** Test it, try it in every way. Compare the reception it brings you, to the reception you can get with any other kind of antenna. If it isn't clearer, louder, sweeter and better in every way, this test is free.

MAIL COUPON TODAY

Clip, fill in and mail now. No obligation whatever. We'll send you full details of the new improved SUBANTENNA and particulars of our FREE TRIAL OFFER and the truly amazing tests we want you to make entirely at our risk. Mail the coupon right now — at once.

SEND NOW FOR GUARANTEE OFFER

Cloverleaf Mfg. Co.,
2714B. Canal St.
Chicago.

Send me full details of the new, improved Subantenna and particulars of *Free Trial Guarantee Offer.*

Name.....

Street.....

Town.....

State.....

Users Agree It Is the Greatest New Thing in Radio

"I have a switch on my cabinet by which I can throw from an aerial to the Subantenna. For example, I tune in WEAF on the Subantenna and find I have to turn down my volume control to almost a full quarter away from "OFF." Then, reversing to the aerial I can hear barely a sound, and this is only the same night I installed the Subantenna. If it improves with settling, it should be more than remarkable."

Neville Seymour, Newark, N. J.

Beats Everything Else

"I am writing to tell you that last night I gave my Sub a good test and must say it was anything best that I have ever seen and under any conditions. The stations always come in at the exact same spot, and the quality and tone are far better than obtained with the noisy overhead aerial. You had better send me some order blanks You did send me some before but I misplaced them."

A. W. Turner, Baltimore, Md.

CLOVERLEAF MFG. CO., 2714B Canal St., CHICAGO

FATIMAS

and don't spare the horses!

Day in and day out, from clubs and liners, hotels and homes, comes the call for this excellent cigarette. It isn't that "price doesn't matter"—but that *taste* matters so much more!

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LIGGETT & MYERS
TOBACCO CO.

OUTSTANDING FAVORITE AMONG HIGHER PRICED CIGARETTES